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Electrical World

The Consolidation of Electrical World, Electrical Engineer and American Electrician

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Preaching the Gospel of the Industry

AN EDITOR of an industry publication comes in contact with the intimate affairs of the industry he serves. He also views those affairs with a certain perspective because of his breadth of contact and because of his position as an interpreter of industry policy.

Sometimes, however, an editor can serve the industry by giving the public an interpretation of the objects and ideals of those actively engaged in building and serving. Editors of the ELECTRICAL WORLD are frequently called upon at public gatherings and at Rotary, Kiwanis and Chamber of Commerce meetings. Naturally they talk about the electrical industry.

A striking instance of a service of this type is illustrated by this photograph of R. L. Shepherd, Southern editor of the ELECTRICAL WORLD, giving a radio broadcasting address at station WAPI of the Alabama Polytechnic Institute at Auburn, Ala. His talk dealt with the subject of how electricity enables home dwellers and industry workers to do old jobs in a new way. This address was published in Alabama papers, and the newspapers reported that people all over the South sent in appreciative communications to the broadcasting station.

This is one of many instances in which one or another of the fourteen ELECTRICAL WORLD editors has been called upon to tell the story of electricity to the public. They do these tasks as part of their constructive service to the industry.

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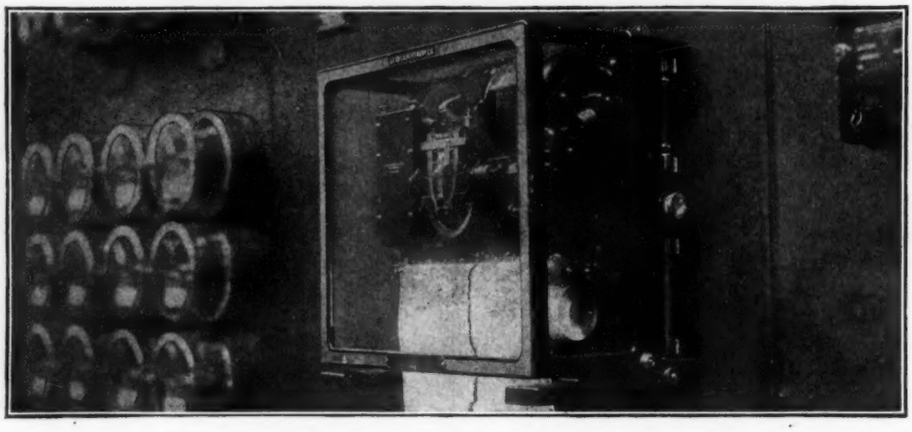
RECORDING FREQUENCY
At Livingston Station



L & N Frequency Recorder at Livingston Station, Staten Island Edison Company

THE chart of this new L & N Frequency Recorder is 10" wide. The full width corresponds to 4 cycles (58 to 62) in the 60-cycle instrument, so that each 1/10 cycle occupies ¼" on the chart. The electrical circuits are new, but the elements of both circuits and instrument are old and are known to be exceptionally stable. The temperature coefficient is negligible. Accuracy 1/10 cycle at 60 cycles.

Have You a Copy of this Booklet?

IF NOT, we shall be glad to send it at once on request. It is brief and clear. It sets forth the problem of Frequency Control, describes the new L & N Recorder, explains its electrical circuit, gives prices and dimensions—all in 8 pages and cover.

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Electrical World

Published by McGraw-Hill Publishing Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 88 — *New York, Saturday, August 28, 1926* — NUMBER 9

An Illustrious Nonagenarian

AMERICAN engineers, in common with their countrymen of other callings, will pay spontaneous tribute to the grand old man whose death removes one of the foremost intellectual leaders alike of this generation and of the last. Indeed, they will with difficulty refrain from going further and claiming Charles W. Eliot as a bright ornament of their own profession. This impulse springs not so much from remembrance of the chemical pursuits that filled his early life as from the fact that he had the mentality and the temperament of the born engineer. Love of order, calmness of mind, clarity of thought, logic, perspicacity, method, precision characterized all he did. He loved to build, and he lived to rear a new university on old foundations, to erect new educational formulas that have won general acceptance, and to lend repeatedly a helpful hand in shaping the evolution of thought along high lines alike in religion, in politics and in the business world.

Dr. Eliot lived to the great age that men associate with Shakespeare's "last scene of all, that ends this strange, eventful history." But no "second childishness or mere oblivion" obscured his passing. He died in full intellectual panoply, still giving of his best to his country and to the world, still looking ahead and not behind, radiating courage and optimism. He was a great citizen, and his memory will be a lasting inspiration.

Utility Securities Legal for Savings Banks

FUNDS of savings banks must, by common consent, be invested on an ultra-conservative basis. The most rigid scrutiny of securities is warranted and the qualifications that make such securities legal investments should be very stringent. By legislative act Massachusetts has made approved utility bonds legal investments for savings banks in that state, and the bonds of twenty-three light and power companies have been found to meet the rigid specifications of the act.

Securities of both large and small properties are in the list published on page 398 of the ELECTRICAL WORLD for August 21, and these properties are scattered over all parts of the country. Heretofore light and power bonds have not been legal investments for savings-bank funds except in a few states, and no thought of meeting this type of investment specification has been in the minds of most leaders of the industry in building their financial structure. It is gratifying, therefore, to find such a large number of properties which have issues legal for this type of investment. Many other securities are certain to meet the requirements after a few changes.

Acceptance of light and power bonds as a legal investment under this act is not a measure of the credit or standing of the utility companies or of the merit of their securities. It is no reflection on other securities to find them ineligible under the act. The large majority of utility securities are issued to raise money under the competitive conditions found in the money markets and meet the safety requirements of those markets. They have been issued without thought of meeting the very conservative market available in savings-bank funds. These funds must be safeguarded very carefully and necessarily are invested in securities which are safeguarded in every respect and therefore give very low rates of return.

It is, however, an encouraging sign of the times to find that millions of dollars in savings-bank funds are now available to the industry. A new market for capital is afforded; a conservative element in utility finance is introduced, and in great measure a comparative yardstick has been supplied through the adoption of specifications. It is to be hoped that many other states will be added to the list, for there is no doubt that the electrical industry and the savings banks will benefit equally.

Public Interest Paramount in Local Utility Mergers

RECENT tendencies toward the combination of electric service companies with gas companies and traction systems in identical communities deserve the careful study of regulative bodies, financiers and executives in order that the best interests of the public as a whole may be served by such proposals. It may not be amiss to reiterate the sturdy truth that short of confiscation the public is literally all-powerful in its control of company activities, and the first duty of merger promoters is to prove that each particular plan is in the best interests of the body politic. It is not enough to prepare a case for presentation before a state commission to demonstrate the economic benefits of local consolidation; the full measure of citizenship demands a complete and convincing exposition to intelligent laymen that a local merger is not only justified but necessary.

There are many successful "combination" companies doing business in the electric service field today. Undoubted economies in administration may be secured through properly planned and efficiently handled mergers, but in each new proposal the burden of proof lies with the proponents. The great prosperity of the electric service industry tempts the promoter to design mergers wherein less prosperous utilities may benefit by consolidation with central-station companies. Immediately a complex problem is in hand. To what extent should the remarkable vitality and growth of central-station prosperity be allowed to revive the

drooping dividends or sustain the net earnings of less successful public services?

Each case must be analyzed on its own merits; but it is fundamental to the public interest and therefore to the best interest of the electrical industry that all of these services shall be efficiently supplied if the public demands them at all, and it is an ironclad law of economics that their full and proper cost must be met out of revenues, including in this cost all recognized fixed and operating expenses and a return sufficient to attract new money for development. It is elementary that if the net earnings of a central-station company are in part to be pooled to help maintain better trolley or gas service in a community, the price of electric service to the public cannot be as low as under separate ownership unless the combination insures offsetting economies in management, operation or fixed charges. Simple as this point is, it is easily overlooked in explaining the benefits of mergers to the local public. Every such plan, we reiterate, should be made clear in intent and outcome to the public, which must in the long run decide whether it prefers electric service or combined services at minimum cost in any given territory. The public must be enlightened as well as the regulative authorities, and promoters who fail to realize and act upon this principle do so at their peril.

Cost Allocations Legitimate Guides

AN INTERNAL study of any business is usually predicated on an accurate cost allocation. Such an analysis is the first step in acquiring the knowledge whereby executives can guide developments intelligently, measure past progress and operate more effectively. For this issue of the ELECTRICAL WORLD Colonel C. F. Lacombe has written a very thoughtful and constructive article on cost allocations in the light and power business. He has had many years of experience as a background for the article, and it deserves careful consideration from utility executives. The reasons for the use of cost allocations are stated clearly, and definite material is introduced to show how a cost allocation can be used as a guide by executives. In his opinion, the making of a cost allocation is easy for a particular property, even though it is difficult to generalize on the subject or to introduce a uniform method which can be used for all properties.

Debates between cost experts on the use of class demands, peak demands, load factors, diversity factors and other technical elements in the production of cost allocations are fruitless. Each system has local conditions of load, of investment allocations and even of operating conditions because of which it should be treated as a specific case. If this is done, most of the technical points in the problem are immediately solved and the allocation is readily made. Cost allocations are fundamental in building rate systems and in securing an adjustment of the income from different classes of business. But it must not be supposed that a detailed cost analysis for any class of business considered should be incorporated as a rate schedule. It is merely an executive tool which will serve as a guide in making a rate which will get certain results. Rate making is a "follow-on" and entirely different activity from cost analysis. The value of a cost analysis is much greater than its use for rate-making purposes.

The great value of a cost allocation is its use with revenues and energy units to get definite information on the trend of the total business and of each class of business. The proportionate division of investment, income, sales and cost between classes of business over a period of years in terms of the total business readily gives a utility executive knowledge of how the business is developing and tells him what steps should be taken to improve the business before conditions become critical. While few light and power companies have made cost allocations, it is apparent that the time is ripe for their greater use as guides to better and faster service developments on a profitable basis.

Serving the Farmer with Electricity

THERE is a homely saying to the effect that the way to begin is to begin. Likewise the way to serve the farmer is to serve him. Apparently many managers of properties have not regarded the policy of extending circuits into rural communities as an idle gesture and have made an earnest effort to carry the benefits of electricity to the farmer. This the new lines which stretch along country roads amply demonstrate. Not all executives, unfortunately, are fired with the spirit of adventure or a desire to reach out into new territory. Their attitude is rather to sit and wait for the business to develop; if it can be proved to their satisfaction that rural lines can be made to pay, they may build a line or two, but they will have to be guaranteed against loss. Meanwhile, however, they have nothing to offer, and if a farmer should apply for service he would be met by a curt refusal.

Now, it is not the function of an electric light and power company to refuse service except in exceptional cases, as, for example, where the applicant has defrauded the company or stolen electricity for which he refuses to pay. For every application for service the company should have some proposition. The requisite rates may seem to put agreement out of the question; but it is for the customer to decide whether the service is worth that to him, not for the company to refuse to render it. Instances have come to our notice recently where in a section of the country which would be classified as suburban service was absolutely refused to farmers. Certainly, those in charge of the properties are lacking in vision and out of tune with the industry. Its purpose is to serve society at rates that are reasonable and attractive, to spread its circuits into every hamlet and town, and to find a way to make the business profitable to both the company and its patrons, if that is at all possible, and usually where there is a will there is a way.

Better Refrigeration Servicing Records Needed

MANY interesting facts in relation to the development of electric refrigeration are coming to light in the national survey now being made by the ELECTRICAL WORLD. These facts, based upon country-wide data, will in due course be presented to our readers in order that the most desirable trends in commercial practice and development may be known and acted upon. As the work progresses, however, certain points stand out like high mountain peaks above the plain of daily

experience and may be commented upon before the survey journeys end. One of these is the matter of servicing records.

Accurate information regarding field performance, and especially operating troubles, is of basic value to a developing branch of electric service like refrigeration. To procure such information should be easier than is at present the case with many dealers. The details are known by the personnel of the servicing organizations as they go about their daily tasks, but too often the causes of service calls are never put on paper; no adequate card index or loose-leaf record of equipment performance exists, and the memory of the service man remains the repository of these truly vital statistics of a great and growing industry. This applies to the central-station company, to the factory branch and to the "free lance" field agent as well.

The correction of the situation need not be either complicated or difficult. The art is still young enough to enable records begun today to bear good fruit in the coming months, and the great volume of refrigeration unit sales sure to be made in 1927 deserves the background of a far better servicing record than is usually encountered in this summer's survey. It is nothing new for the electrical industry to have to overcome a constitutional dislike of clerical work on the part of maintenance men, but these will be among the first to benefit from improved practice in this respect. The value of good records to the manufacturers and dealers who already maintain such is sufficient answer to the objections which may be raised by those who consider themselves too busy to keep them.

Flexibility and Reliability Characterize Kearny Station

THE completion of the first section of the Kearny station of the Public Service Electric Power Company adds another mammoth generating unit to the extensive equipment already serving the New Jersey metropolitan area. When completed this new plant will have a rating of 400,000 kw. and will serve as a source of supply to the loads in the surrounding territory and to furnish energy to any interconnected system that may develop in the area. Since the total output of the station goes to a 132,000-volt substation for distribution, it can be used readily for any future high-voltage interconnections.

A study of the station design as outlined in this issue leads to the conclusion that the utility executives wished to build a conservative station which would be useful for many years. Reliable service was accented and the investment was made to get this kind of service. Group arrangements, spare auxiliaries, duplicate buses and feeders, accurate and ample controls, vertical and horizontal isolation of conductors and equipment and unit installations are some of the features which give the reliability sought.

From the standpoint of economical operation the station should stand well up in the list of good American plants. A steam pressure of 385 pounds and a temperature of 720 degrees F. is a conservative starting point for good operating economy, and the use of four-stage bleeding, all-electric auxiliaries and bus auxiliary supply adds economic features to the heat-balance arrangements. Steam auxiliaries for circulating-water pumps, condensate pumps and boiler-feed pumps are carried as a service insurance and for emergency station starting only, and the fact that the station is connected to nearby power houses by multiple tie lines makes a bus supply for auxiliary service an economical and satisfactory solution of this problem.

The electrical arrangements are flexible and well considered. Phase isolation in the vertical direction gives safety from phase-to-phase short circuits, and the designers have employed horizontal isolation to separate oil-immersed apparatus. As a result the switch house should be free from fire hazards and easy to operate.

The Kearny plant is a modern economical stoker-fired station which should operate splendidly for many years. It abundantly sustains the reputation of Public Service engineers for building soundly and well from the standpoint of giving reliable and economical service.

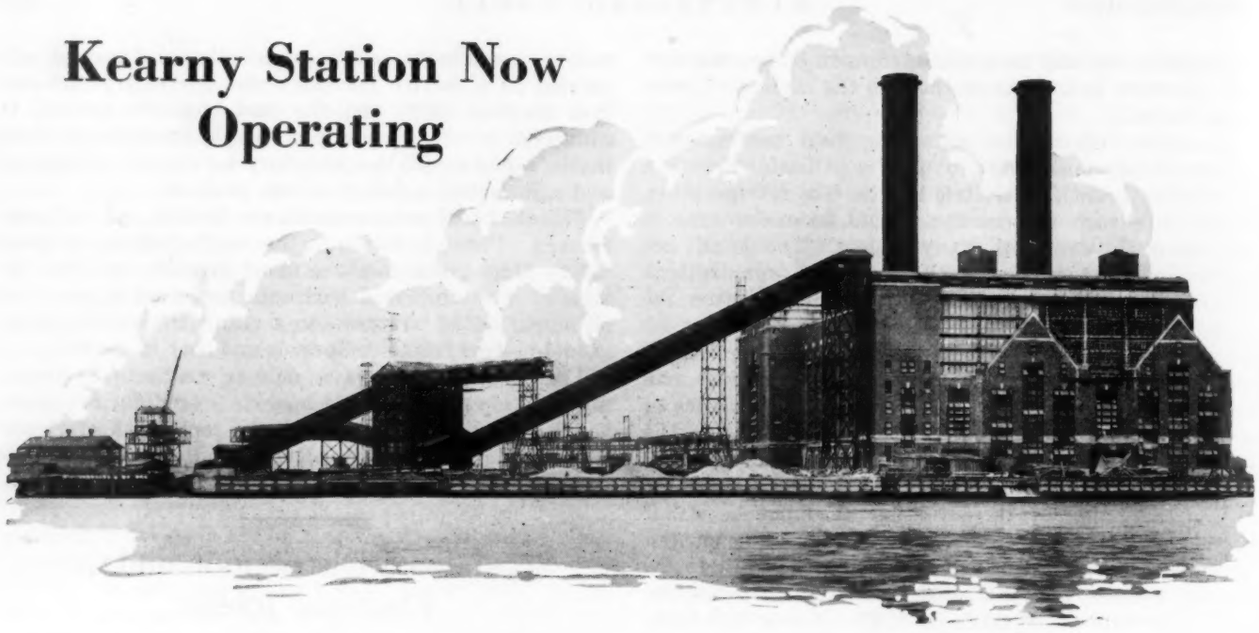
Specialized Distribution and the Electrical Jobber

B. C. FORBES, well known to the electrical industry, in a recent syndicated editorial raises a well-conceived point. "Is it not possible," he asks, "that, instead of the abolition of middlemen, thoroughly scientific distribution will call for the employment of middlemen on a greater scale than ever before?" He is talking about the Graybar Electric Company and the economic function it performs in the distribution of some 60,000 articles of electrical manufacture, and he continues: "The primary job of a manufacturer is to manufacture. The primary job of a distributor is to distribute. And are not the various functions of business becoming more and more specialized?" Here is something worth thinking over.

There are many who believe that the electrical jobber is slowly fading out of the picture. They see the purchasing of the power company centralizing more and more at the head office of the holding company. They see a large amount of direct selling by many manufacturers to the local trade. They have heard much pessimistic talk by the jobbers themselves from time to time. They conclude that the trend in the electrical industry is away from jobber distribution. But if this were true, would the Graybar organization be steadily opening additional branches in more cities? And would the General Electric and Westinghouse jobber groups be slowly growing in number year by year? For if any manufacturer could dispense with the jobber, surely it would be these two great nationally organized companies.

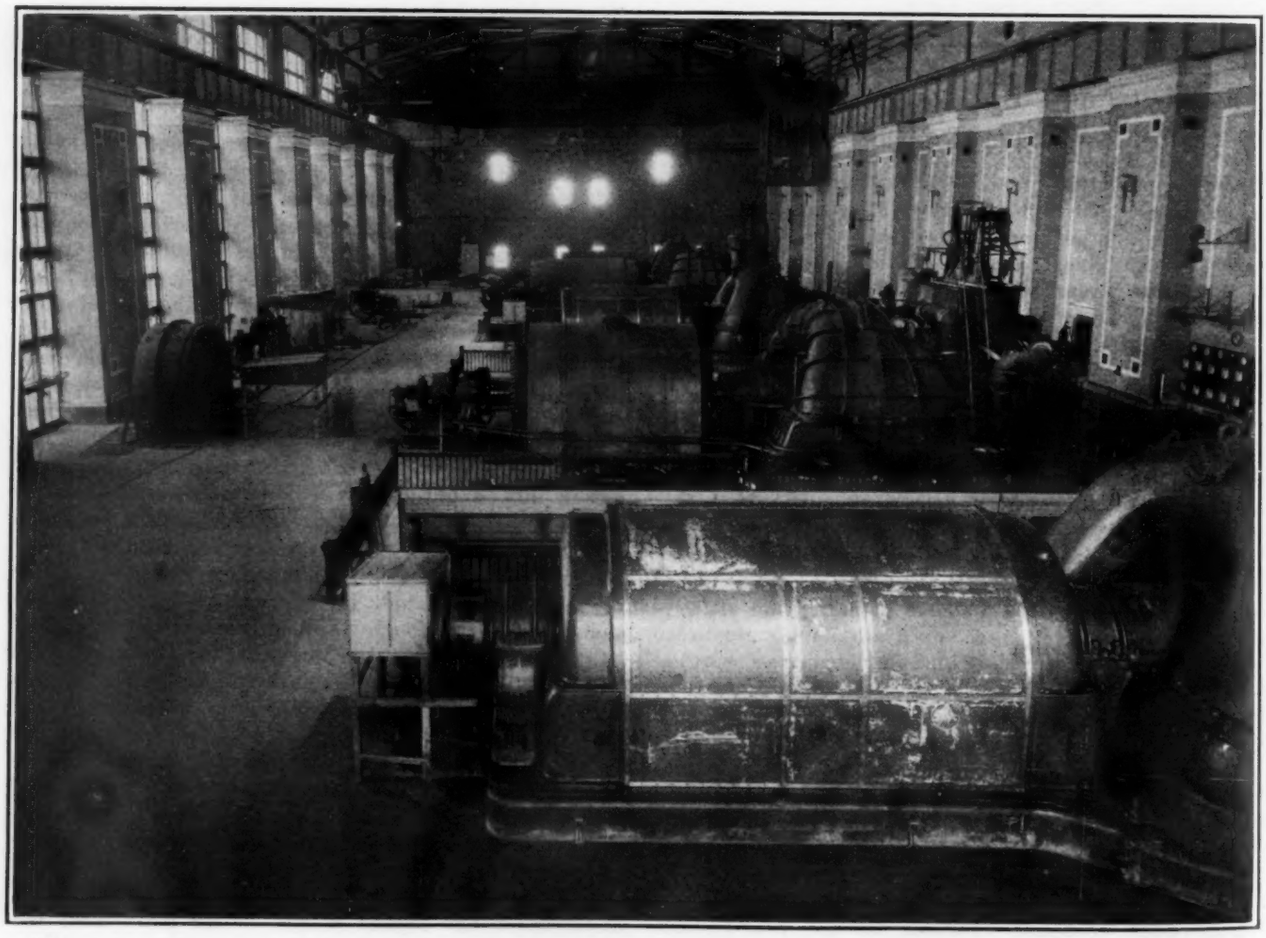
Times have changed with the electrical jobber, it is true. But this trend is not necessarily forcing the jobber out of business. Rather it is impelling him, if he expects to stay in the business, to a change in his own attitude and organization. Service, after all, is what counts in the jobbing business as in every other business. The growing need today is primarily not for a warehouser of staples or for an order taker so much as a creative distributor of specialties, including domestic appliances. And the opportunity for profit in that field will eventually be greater than anything the jobber has ever known. Forbes closes with this question: "If distribution is to be made a science, are not distributors the logical people to do it?" And the answer is obviously—yes!

Kearny Station Now Operating



THE Public Service Electric Power Company of New Jersey has completed the first installation of the new 400,000-kw. Kearny station. The entire output of this station is distributed at 132,000 volts through an outdoor substation located at the plant.

The illustration at the top shows the Kearny plant from the river, while below is a view of the interior of the turbine room with a number of units already in place.



Features of Kearny

New Station of Public Service Electric Power Company

By N. L. POLLARD
Consulting Electrical Engineer, Public Service Production Company

Choice of Site, Arrangement of Electrical Equipment, Control of Auxiliaries, 132,000-Volt Switching, Proposed High-Tension Transmission Are Features

NEW JERSEY'S largest generating station is the steam plant of the Public Service Electric Power Company now under construction at South Kearny. It was designed and is being built by the Public Service Production Company, the engineers and constructors associated with the Public Service group of New Jersey. The complete installation will consist of ten turbo-generators having a total rated capacity of 400,000 kva. at 80 per cent power factor.

The site chosen for the station, midway between the Essex and Marion stations of the Public Service Electric & Gas Company, may be considered at the load center of the district. It is on the west shore of the Hackensack River near its junction with the Passaic and therefore promises an adequate supply of suitable condensing water. The property itself covers about 80 acres and was originally marshy land partly submerged at high tide.

In order to obtain the shortest route for the coal, which will probably later be brought to the station for the most part in barges, the bunker house was built adjacent and parallel to the river, and the boiler house, turbine room, switch house and outdoor substation next, in the order named. This arrangement obviously necessitated intake tunnels underneath the bunker and boiler houses.

The first half of the station comprises five units, the turbines of which are designed for normal operation with steam of 325 lb. gage and 700 deg. F. at the throttle. The generators are cooled by air recirculated through Griscom-Russell two-pass U-fin coolers. The sections of the coolers are interchangeable and equipped with roller bearings so that any section can easily be replaced by a spare. Salt cooling water is taken from the discharge pumps of the circulating pumps and, since the ends of the discharge pipes from the coolers are submerged below the water level in the discharge canal, the water pressure in the cooler tubes is about the same as that of the atmosphere, eliminating the danger of spraying water from a split tube into the generator-lead compartments.

Each condenser receives its supply of circulating water from two motor-driven pumps so connected that one pump can supply either half of its own or any other condenser in the station. One turbine-driven circulating pump, in the middle of the ultimate turbine-room basement, is connected to a header and serves as a spare for any condenser. Two condensate pumps, one motor-driven and one turbine-driven, are connected to each unit, the former serving as a regular and the latter as a spare.

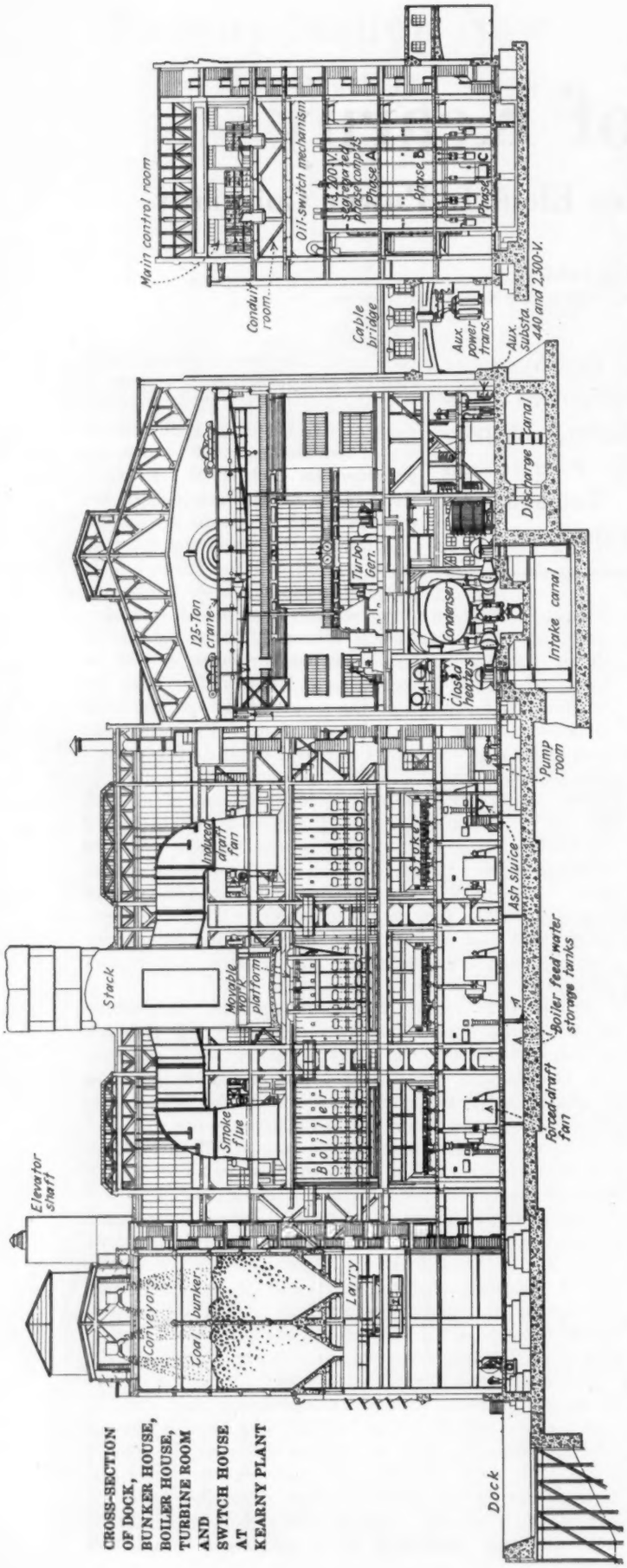
For removing air from the condensers, two batteries, each consisting of two steam-jet air pumps, are provided on each shell. In addition, three of the condensers are equipped with hydraulic air pumps.

Although the plans for the ultimate station call for three boilers per unit arranged in ten banks, the present installation comprises only four banks, each consisting of three Babcock & Wilcox 2,360-hp. boilers designed for a maximum operating pressure of 385 lb. gage and a total temperature of 720 deg. F. They are provided with stokers of the single-fired type and with forced-draft and induced-draft fans. Provision has been made for varying the speed of the stokers and fans in order that each boiler may operate at numerous ratings from below normal to 350 per cent of normal. One of the stokers is equipped with a complete Bailey combustion-regulation system to control the draft in relation to the rate of coal feed and the rate of steaming. Three motor-driven feed-water pumps have been installed for the four banks of boilers. Two spare turbine-driven pumps have been provided for emergency service and are controlled by Foster differential governors.

In order to secure maximum economy, four-stage bleeding and motor-driven auxiliaries, fed through transformers from the station buses, were adopted. The heat balance was therefore calculated on the basis of using electric drive on all the auxiliaries, the steam-driven auxiliaries being only emergency units.

Generators.—The first section consists of three General Electric 39,200-kva. and two Westinghouse 43,750-kva., 80-per-cent-power-factor, 1,800-r.p.m. turbine-driven generators, the third unit of which was placed in service on June 3, 1926, and the remaining two of which are expected to be put into operation before the end of the year. Normally rated at 13,800 volts, they will deliver rated kilovolt-amperage at any voltage between 13,200 and 14,200 and are equipped with direct-connected 250-volt shunt-wound exciters.

The stator windings of each generator have two circuits per phase. For phase protection one current transformer in each phase lead and one in each neutral lead are connected to a single-pole differentially wound relay. For interwinding protection one current transformer, having two balanced primary windings and one secondary, is placed in the neutral end of each pair of windings and connected to a single-pole single-coil relay.



CROSS-SECTION OF DOCK, BUNKER HOUSE, BOILER HOUSE, TURBINE ROOM AND SWITCH HOUSE AT KEARNY PLANT

The neutral of each generator is connected to a common bus through a single-pole oil circuit breaker. The neutral bus is connected to ground through a grid resistor having a value of 2, 4 or 8 ohms. For the present the 2-ohm connection of the resistor is being used. An electrically operated oil circuit breaker is installed to bridge the resistor, in order that the latter may be short-circuited should this become necessary for relay action.

The leads from each generator are connected to tubular buses, one conductor per phase. These buses extend under the turbine-room floor and cross to the switch house by means of two bridges between the buildings.

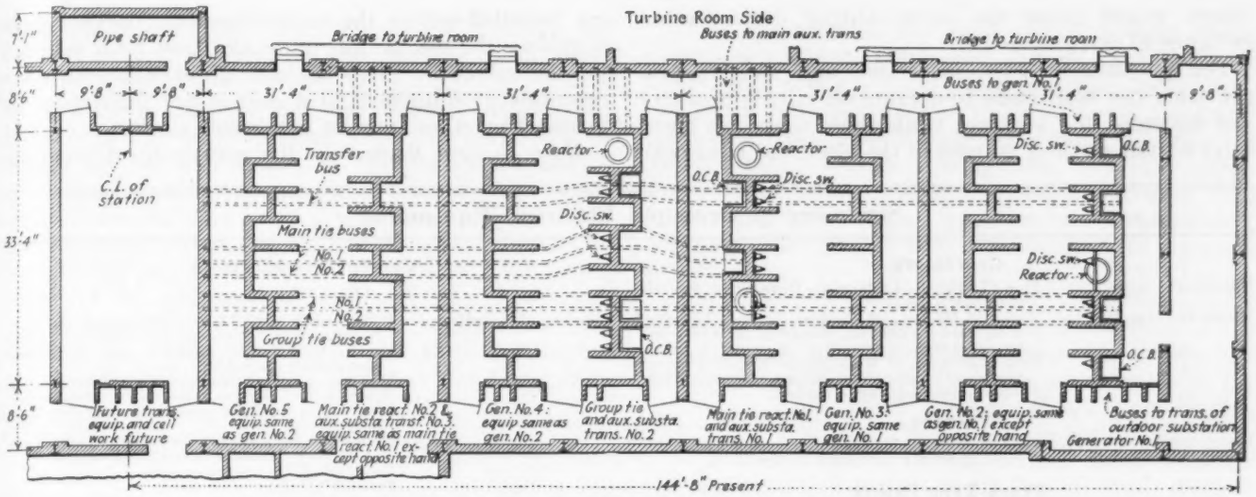
Arrangement of Equipment in the Switch House.—Segregation has been developed to an unusual degree in the switch house. The switching equipment is isolated vertically as regards the separation of phases and horizontally as regards both the separation of one group from another and the separation of oil-immersed apparatus from all other equipment.

Each of the three lower floors is used for the oil circuit breakers, disconnecting switches, reactors and buses of one phase. The fourth floor contains the mechanism for operating the oil circuit breakers and disconnecting switches, whereas the fifth floor accommodates the conduit room, machine shop, etc., and the battery room and its equipment. The main control room constitutes the sixth floor and is immediately above the conduit room.

The generators will normally feed directly to their respective transformer banks and operate in synchronism through the group-tie and main-tie buses, both of which are installed in duplicate. Any generator can, however, be connected to any bank of transformers by means of the transfer bus. The operation of groups of three and two units, respectively, as separate stations and, if need be, at different voltages is permitted by a sectionalizing oil circuit breaker in the group-tie bus. This breaker will normally be open and the two sections of the bus tied together by means of the main-tie bus, thereby adding a reactance of 4 per cent at 2,000 amp. in each connection to 7 per cent at 1,200 amp. provided between each generator bus and the group-tie bus.

Power for the station-auxiliary transformers is taken from the main-tie bus, thus insuring service to these transformers regardless of whether one or both of the sections of the group-tie bus is furnishing power. The reactance of these transformers is 5 per cent, and, in order to limit the short-circuit current to a safe value on the 2,300-volt buses feeding the station auxiliaries, an additional reactance of 5 per cent at 314 amp. is provided in each transformer feeder.

The oil circuit breakers and other equipment of each generator and each station-power-transformer feeder are grouped in separate bays and inclosed in individual cells. The oil-circuit-breaker cells are separated by a wall from the cells containing the disconnecting switches, reactors and operating mechanisms, thus protecting the latter from any conducting gases which may be thrown from an oil circuit breaker. The arrangement is such that in case of a disastrous explosion the oil and flame will be thrown against a solid brick wall directly in front of the breakers. The oil circuit breakers and disconnecting switches are operated from the mechanism wells by means of square rocker shafts through the walls. The bearings for these shafts, on the oil-circuit-breaker sides, are integral with the wall


Turbine Room Side
Pipe shaft
Bridge to turbine room
Buses to main aux. trans
Bridge to turbine room
Buses to gen. No. 1
Transfer bus
C.L. of station
Main tie buses
No. 1
No. 2
Group tie buses
Reactor
Disc. sw.
O.C.B.
Future trans. equip. and cell work future
Gen. No. 5 equip. same as gen. No. 2
Main tie react. No. 2 & aux. substa. transf. No. 3 equip. same as main tie react. No. 1 except opposite hand
Gen. No. 4 equip. same as gen. No. 2
Group tie and aux. substa. trans. No. 2
Main tie react. No. 1 and aux. substa. trans. No. 1
Gen. No. 3 equip. same as gen. No. 1
Gen. No. 2 equip. same as gen. No. 1 except opposite hand
Buses to trans. of outdoor substation Generator No. 1
144'-8" Present

APPARATUS ARRANGEMENT PLAN OF SECOND FLOOR OF KEARNY SWITCH HOUSE

to prevent the passage of conducting gases into the mechanism wells.

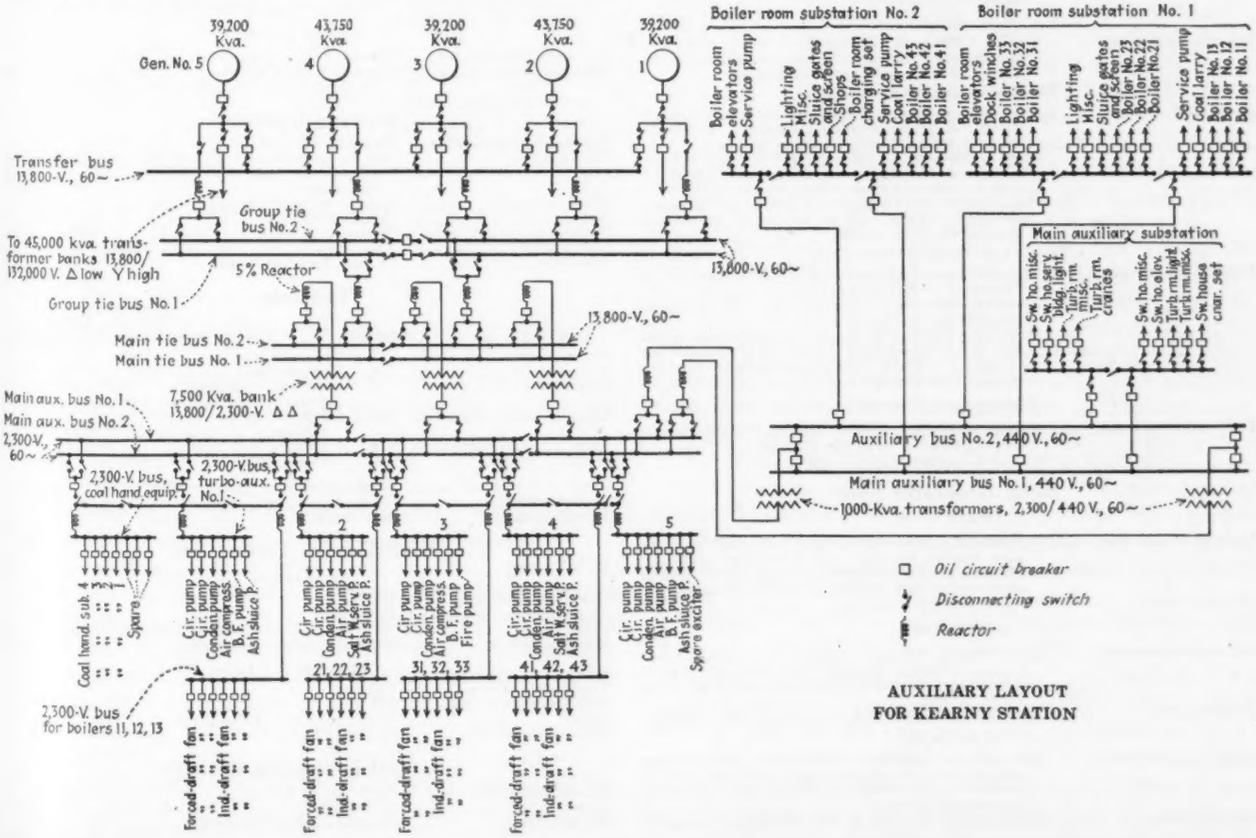
An induced-draft system of ventilation is provided for the three-phase floors of the switch house. A flap damper in each duct line, leading directly to the outer air, provides an outlet for possible explosions.

Interlocking of the 13,800-Volt Equipment.—Interlocking, both direct and selective, to prevent erroneous manipulation and fix the sequence of operation and to insure apparatus and attendants against accident, is employed to an unusual degree. Direct interlocking is accomplished both mechanically and electrically. Selective interlocking is accomplished mechanically only.

Direct interlocking is used between each oil circuit breaker, its disconnecting switch or switches and the corresponding cell doors. The locking is of the interlocking type—that is, a closed disconnecting switch locks its doors if closed, and its doors, if open, block the closing of the disconnecting switch.

In addition to the direct interlocking, selective interlocking is provided between each oil circuit breaker and its two or four sets of disconnecting switches. If one set of disconnecting switches is closed and is locked by the closing of the oil circuit breaker, the other set can be closed; the closing of this second set allows the first set to be opened, if desired, but the set remaining closed is locked.

Special electrical interlocking is provided for the main-tie-bus sectionalizing disconnecting switches. They are locked by gravity whether open or closed and are released by the operation of solenoids only when all the selector disconnecting switches are open which, if



AUXILIARY LAYOUT FOR KEARNY STATION

closed, might cause the sectionalizing disconnecting switches to carry current.

For purposes of test, inspection and maintenance, provision has been made to operate oil circuit breakers and disconnecting switches while their doors are open. Push-button stations to release the electrical interlocks are installed within the compartments. Locking dogs to release the mechanical interlocks have been supplied for the operators. This scheme, however, prevents the operation of equipment at a door either unattended or attended by other than an authorized agent.

Main Control Room.—In the main control room, on

Summary of Principal Electrical Equipment

Generators

Number and type..... Five 13,800-volt, 1,800-r.p.m., three-phase, 60-cycle 0.80 power factor.

Rating and manufacturer . Three 39,200-kva., of General Electric Company, with 160-kw., 250-volt, shunt-wound, direct-connected exciters.
Two 43,750-kva., of Westinghouse Electric & Manufacturing Company, with 165-kw., 250-volt, shunt-wound, direct-connected exciters.

Feeders

Description..... Four 90-000-kva., 132,000-volt, three-phase, 60-cycle (with space for six future feeders).

Truck-Type Panels

Main Auxiliary Substation

Manufacturer..... Westinghouse Electric & Manufacturing Company.
Type of breaker..... "B-13."
Description and use..... Sixty-six 600-amp., 15,000-volt; interrupting capacity 20,500 amp. at 2,500 volts, 90,000-kva. Sixty-two of these are used for feeders to 2,300-volt auxiliaries; four are spares for emergency use.
Six 2,000-amp., 7,500-volt; interrupting capacity, 100,000 amp. at 480 volts, 83,000 kva. Four of of these are used for 440-volt main-auxiliary-bus incoming lines; two are spares for emergency use.
Six 1,200-amp., 7,500-volt; interrupting capacity, 60,000 amp. at 480 volts, 50,000 kva. These are used for 440-volt group feeders.

Disconnecting Switches

Switch House

Description and use..... Fifty-five 3,000-amp., 25,000-volt; manually remotely operated, T.P.S.T., Type "LG-116" of General Electric Company. These are used for circuit-breaker isolation and bus selecting.

Outdoor Substation

Description and use..... Fifty-five 800-amp., 154,000-volt; motor-operated, fifty T.P.S.T., type "RH," and five S.P.S.T. of Westinghouse Electric & Manufacturing Company. These are used for circuit-breaker isolation, bus selecting and bus sectionalizing.

Auxiliary Substations

a Main Auxiliary Substation

Description and use..... Twelve 3,000-amp., 7,500-volt; S.P.S.T. of Champion Switch Company. These are used for 2,300-volt main-auxiliary-bus sectionalizing.

b Two Boiler-House Substations

Description and use..... Fifty-eight 400-amp. 2,500-volt; S.P S.T. of Pringle Electric & Manufacturing Company. These are used for 440-volt circuit-breaker isolation.
Eight 1,200-amp., 2,500-volt; S.P.S.T. of Pringle Electric & Manufacturing Company. These are used for 440-volt circuit-breaker isolation.
One hundred and forty-seven S.P.S.T. of Champion Switch Company. These are used for miscellaneous 440-volt circuits.

c Three Coal-Handling Substations

Description and use..... Nine 400-amp., 7,500-volt, S.P. tandem selection, of Champion Switch Company.
Forty-two 400-amp., 7,500-volt; S.P.S.T. of Champion Switch Company.
Seven sets, each consisting of three 800-amp., 2,500 volt; S.P.S.T. of Pringle Electric & Manufacturing Company. These 72 single switches are used for circuit-breaker isolation.

Turbine-Room Basement

Description and use..... Fifteen 3,000-amp., 25,000-volt; S.P.S.T. of Electric Development & Machine Company. These are used for generator isolation

Motor-Generator Sets

Turbine Room

Description and use..... One 300-hp., 2,300-volt, 1,200-r.p.m., double-squirrel-cage motor; mounted on same base with one 200-kw., 250-volt, shunt-wound generator, used as spare exciter and emergency battery charger.

Manufacturer ..... General Electric Company.

Boiler House

Description and use..... One 65-hp., 440-volt, 1,200-r.p.m., squirrel-cage motor; mounted on same base with two 20-kw., 140-volt shunt-wound generators, used for charging valve battery.

Manufacturer..... Westinghouse Electric & Manufacturing Company.

Switch House

Description and use..... One 65-hp., 440-volt, 1,200-r.p.m., squirrel-cage motor; mounted on same base with two 20-kw., 140-volt, shunt-wound generators, used for charging control battery.

Manufacturer..... Westinghouse Electric & Manufacturing Company.

Current Transformers

13,200-Volt Service

Number, ratio and use.... Fifteen 1,200–1,200/50, for generator relays.
Fifteen 2,500/5, for neutral-bus differential relays
Ninety 2,500/5, for generator and transformer instruments and relays.
Six 3,000/5, for main-tie-reactor instruments.
Fifteen 2,500/5, for group-tie-reactor instruments.
Nine 500/5, for 7,500-kva.-transformer differential relays.
Nine 400/5, for 7,500-kva.-transformer instruments.
Two 4,000/5, for neutral-ground instruments.
Two 1,000/5, for neutral ground.
Five 1,000/5, for neutral alarm.

Manufacturer..... General Electric Company. These current transformers are of the through type.

2,300-Volt Service

Number, ratio and use.... Two hundred and nineteen from 3,000/5 to 50/5, for 7,500-kva.-transformer-bank differential relays, auxiliary-power-line meters, group-feeder relays and meters, auxiliary relays and meters, etc.

Manufacturer..... General Electric Company. The 3,000/5 and 1,200/5 current transformers are of the through type.

440-Volt Service

Number, ratio and use.... Two hundred and sixteen from 1,500/5 to 50/5, for 1,000-kva. transformer-secondary differential-protection relays, auxiliary-power-line meters, group-feeder relays and meters, auxiliary meters and relays, etc.

Manufacturer..... General Electric Company.

Potential Transformers

13,200-Volt Service

Number, ratio and use.... Thirty 13,200/110 dry-type, for meters and synchroscopes.

Manufacturer..... General Electric Company. These potential transformers are insulated for 19,500-volt service.

2,300-Volt Service

Number, ratio and use.... Eight 2,500/125 dry-type, for meters.
Manufacturer..... General Electric Company. These potential transformers are insulated for 7,500-volt service

440-Volt Service

Number, ratio and use.... Twenty 440/110 dry-type, for meters.
Manufacturer..... General Electric Company. These potential transformers are insulated for 4,500-volt service.

Storage Batteries

Number and potential.... Two 125/250-volt.
Use..... One for general control; one for control of valves. (Either or both may be used for emergency lighting.)
Manufacturer..... Electric Storage Battery Company.
Type of tank..... "Exide F-37."
Type of element..... "Exide F-19."
Number of cells..... 120.
Capacity..... 79 amp. for eight hours.

Reactors

Location	Number	Use	Rating in Amp.	Percentage Reactance
Switch house.....	15	Group-tie bus.....	1,200	7
Switch house.....	6	Main-tie bus.....	2,000	4
Switch house.....	9	7,500-kva. auxiliary transformers.....	314	5
Main auxiliary substation	30	2,300-volt group feeders.....	628	5
Main auxiliary substation	6	1,000-kva. auxiliary transformers.....	251	5

Type..... Single-phase with concrete ribs.
Manufacturer..... General Electric Company
Thermal capacity ..... 30 seconds

High-Tension Testing Set

Transformer

Ten-minute rating ..... 300 kva.
Thirty-minute rating..... 250 kva.
Type..... "K," O.I.S.C., single-phase, 440/30,000-volt.
Manufacturer..... General Electric Company

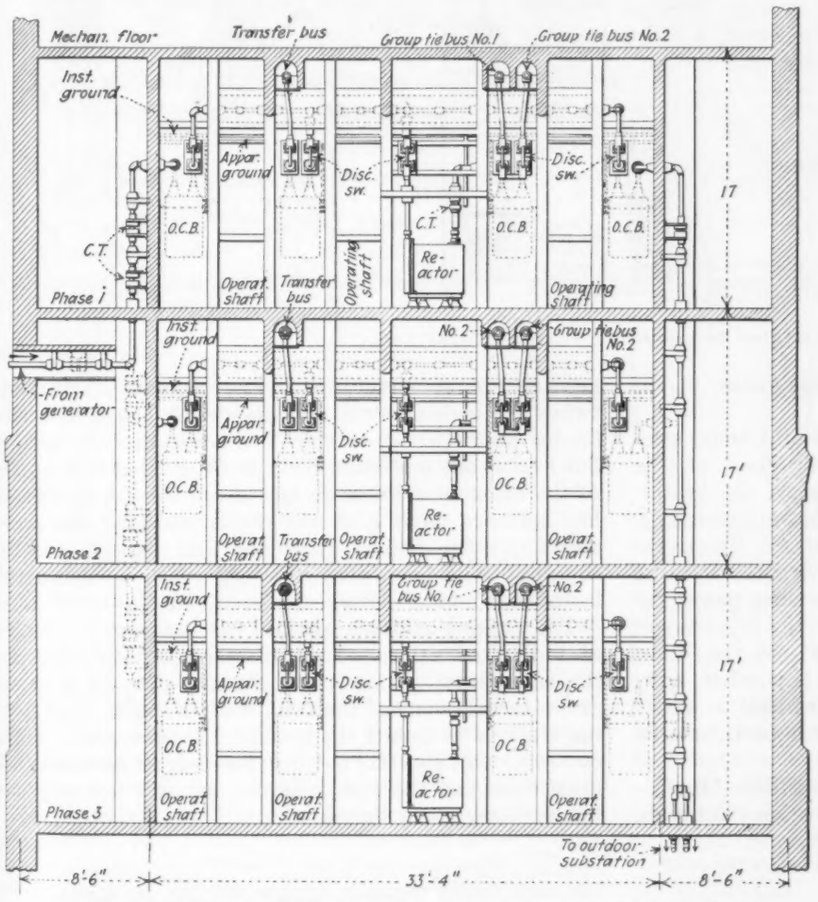
Induction Regulator

Ten-minute rating..... 150 kva.
Thirty-minute rating..... 125 kva.
Type..... "IRS," 60-cycle, 440-440-volt.
Manufacturer..... General Electric Company.

Neutral Grounding Resistor

One-minute rating ..... 7,600-volt 2, 4, 8-ohm.
Type..... "CR-9140."
Manufacturer..... General Electric Company.

the sixth floor of the switch house, are installed the switchboards that control the generators, step-up transformers, 132,000-volt feeders, station-auxiliary transformers and motor-generator sets, together with various instrument and relay panels. The two main switchboards are for the control of the generators and of the step-up transformers and high-tension lines. They are each divided into rows of panels in the form of an arc. In both boards the front rows consist of control benchboards and carry control switches and indicating lamps for the various circuit breakers, etc. The second row carries indicating instruments. Behind the first two rows on the generator side is a third row facing the outside wall of the room. This row carries relays, curve-drawing and recording instruments, and switches for controlling the direct-current distribution for the main control room.



ASSEMBLY FOR GENERATOR BUS AND TIE SWITCHES IN SWITCH HOUSE

The vertical switchboard panels, arranged in a straight line along one wall, control station power service, battery charging, lighting, etc., and carry generator and transformer temperature-recording meters.

A totalizing wattmeter for all the generators and a graphic recording voltmeter connected to the main-tie bus are carried on separate panels in the same board as the other generator recording instruments. This voltmeter and the five generator graphic recording ammeters were made by the Esterline Angus Company. During times of trouble, when excessive overloads and low voltage occur, relays actuate a gearshift in the instrument mechanisms, thereby speeding up the paper travel to 60 times normal and giving an almost oscillographic record.

There are provided for each circuit breaker three colored lamps, red, green and yellow. The red and green lamps give the usual closed and open indications. The yellow lamp is connected in parallel with the green and has a tumbler switch in series with it. When a circuit breaker opens automatically, both the green lamp and the yellow will be illuminated, but when it is intentionally opened by an operator, he will immediately disconnect the yellow lamp by opening the tumbler switch.

Communication and Automatic Signaling.—Fifty telephones throughout the station provide facility for local communication by means of the dial system and for outside communication through an operator in the chief clerk's office. Code-ringing paging bells and gongs are also operated from this office. In each vertical section of the switch house there is installed an interphone system consisting of seven jacks suitable for hand-type instruments and located in places convenient for men engaged in repair work. The turbine-room engineers communicate with the men in charge of the turbine auxiliaries by means of a speaking tube.

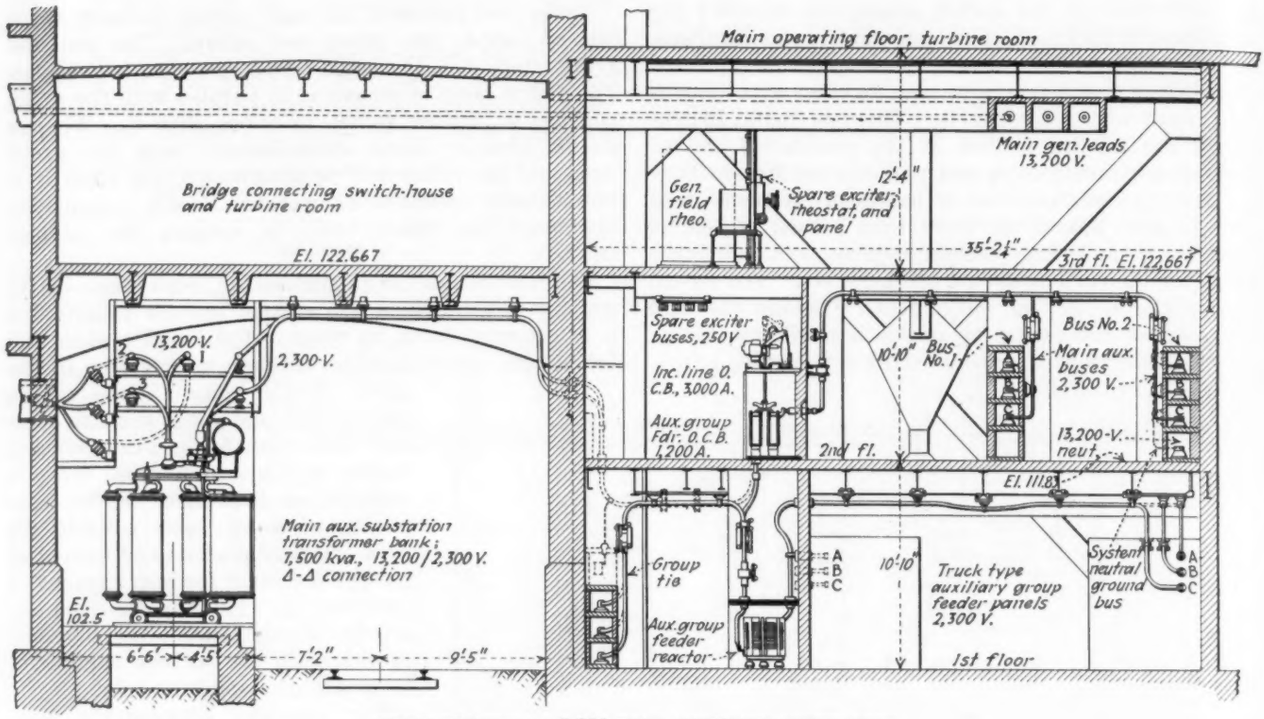
For signaling between the main control room and the instrument panels in the turbine room, the apparatus consists of rotary control switches and illuminated dials showing both the signal received and the signal sent. As each signal is sent, relays automatically operate either electric horns in the turbine room or a bell in the main control room and illuminate the proper dials in both rooms.

For each group of electrical apparatus an annunciator and bells notify the operators of the automatic opening of circuit breakers. The lighting of a yellow lamp on the panel, as previously described, then furnishes indication of the particular circuit breaker that has opened.

There are eight load indicators, located one each in the main control room, turbine room, boiler-room firing aisle No. 1, boiler-room firing aisle No. 2, watch engineer's office, electrician's office, chief engineer's office and assistant engineer's office. The indicators are of the dial type, and the load is indicated automatically by means of a transmitter connected to the totalizing wattmeter.

Provision is made for indicating the positions of selector disconnecting switches, main oil circuit breakers, etc., in both the switch house and the outdoor substation, on a remote centralized load dispatcher's board.

Regular Control of Circuit Breakers, Outdoor Disconnecting Switches, Valves, Etc.—For the control system there are two storage batteries, one located in the boiler house and the other in the switch house. Each battery consists of 120 cells and is connected to an 125/250-volt three-wire bus through a three-pole non-automatic circuit breaker. The discharge rate of each battery is 79 amp. for eight hours, but the tanks are of sufficient size to allow the discharge rate to be in-



CROSS-SECTION OF 2,300-VOLT AUXILIARY SUBSTATION

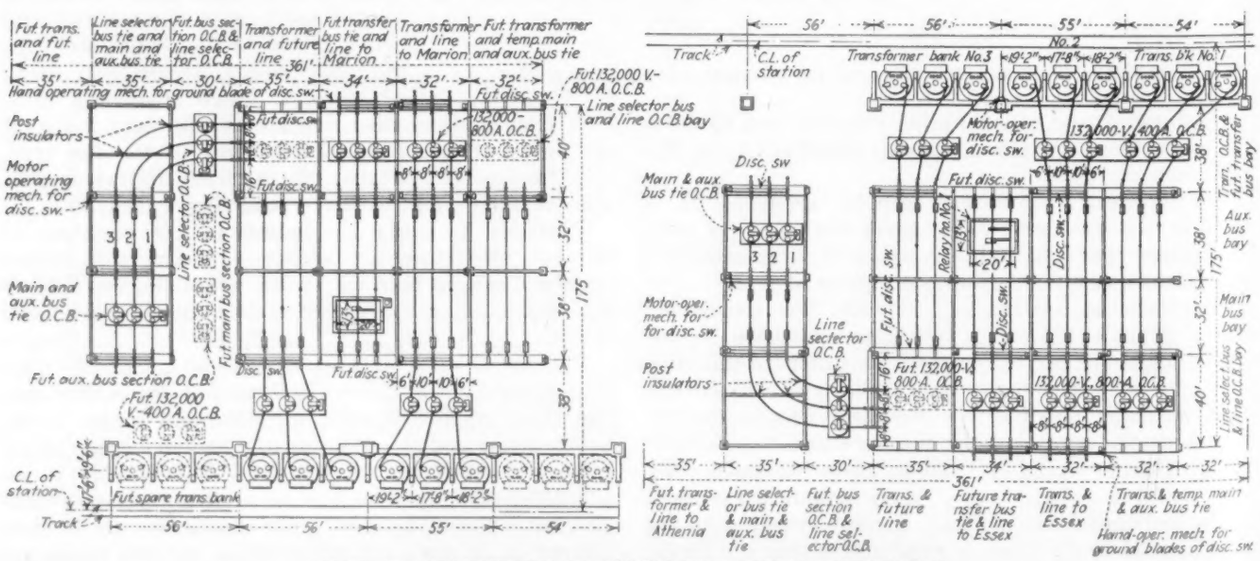
creased, by the installation of additional plates, to 158 amp. for eight hours.

For charging the batteries two three-unit motor-generator sets are used. These normally float on the battery buses. In case of an emergency, the motor-operated spare exciter can be used for battery charging.

One battery normally provides power for the operation of the valve motors and for the emergency lighting system; the other battery normally provides power for the operation of the oil circuit breakers, the 132,000-volt motor-operated disconnecting switches and the other equipment requiring direct current. It is possible, however, to connect the entire direct-current load to either battery, and each battery has sufficient capacity at the present time to carry this load.

Emergency Control of High-Pressure Steam Lines.—There is a centralized valve-control board on the bridge adjacent to the center line of the ultimate station, between the turbine room and the switch house, this site having been selected not only as a point centrally located but also as the one least likely to be enveloped in steam in the event of a break in the steam lines. The board has mounted on it a mimic system showing the main steam piping, boilers, turbines and valves, and is equipped with emergency closing stations indicating lamps and master emergency group-closing controllers.

The control stations permit the emergency closing of individual valves. Each master controller permits the emergency closing of all steam valves of a given group in the event of the failure of the individual closing stations to isolate the break. The emergency drum controller will also trip out the forced-draft and induced-draft fans and the stoker drives, but will not trip out the clinker-grinder drives.


Fut. trans. and fut. line
Line selector bus tie and main and aux. bus tie
Fut. bus section O.C.B. & line selector O.C.B.
Transformer and future line
Fut. transfer bus tie and line to Marion
Transformer and line to Marion
Fut. transformer and temp. main and aux. bus tie
Hand operating mech. for ground blade of disc. sw.
Post insulators
Motor operating mech. for disc. sw.
Main and aux. bus tie O.C.B.
Line selector O.C.B.
Fut. main bus section O.C.B.
Fut. aux. bus section O.C.B.
Fut. 132,000 V-400 A. O.C.B.
Fut. disc. sw.
132,000-800 A. O.C.B.
Fut. 132,000 V-800 A. O.C.B.
Line selector bus and line O.C.B. bay
Fut. spare trans. bank
C.L. of station
Track
Disc. sw
Main & aux. bus tie O.C.B.
Motor-oper. mech. for disc. sw.
Line selector O.C.B.
Relay house No. 2
Trans. bk. No. 3
Trans. bk. No. 1
Motor-oper. mech. for disc. sw.
Trans. O.C.B. & fut. transfer bus bay
Aux. bus bay
Main bus bay
Line selector bus & line O.C.B. bay
Fut. transformer & line to Athenia
Line selector bus tie & main & aux. bus tie
Fut. bus section O.C.B. & line selector O.C.B.
Trans. & future line
Future transfer bus tie & line to Essex
Trans. & line to Essex
Trans. & temp. main & aux. bus tie
Hand-oper. mech. for ground blades of disc. sw.

GENERAL ARRANGEMENT OF 132,000-VOLT OUTDOOR SUBSTATION

Motors

No.	Size Hp.	Volt	Speed, R.p.m.	Type	Use	Manufacturer
10	500	2,300	360	S.R.	Circulating pumps	6 Westinghouse 4 Allis-Chalmers
4	100	2,300	1,200	D.S.C.	Condensate pumps	2 Westinghouse 2 Allis-Chalmers
1	75	2,300	1,800		Condensate pumps	General Electric
2	100	2,300		Syn.	Air compressors	General Electric
2	75	2,300	720	D.S.C.	Air pumps	Westinghouse
1	75	2,300	1,800		Air pumps	General Electric
14	t 760	440		S.R.	Cranes	General Electric
3	60	440	1,800	D.S.C.	Fresh-water pumps	General Electric
3	15	440	900	D.S.C.	Dock winches	General Electric
11	t 17	440		D S C.	L. O. and T. O. pumps	General Electric
2	27	440		S.R.	Elevators	Lincoln Motor
2	15	440	1,200	D.S.C.	Ventilating fans	General Electric
3	600	2,300	1,800–1,690	S.R.	Boiler-feed pumps	Allis-Chalmers
12	300	2,300	514/400	D.S.C.	Induced-draft fans	General Electric
12	225	2,300	900/720	D.S.C.	Forced-draft fans	General Electric
3	200	2,300	1,200	D.S.C.	Ash-sluicing pumps	General Electric
3	125	2,300	1,800	D.S.C.	Salt-water pumps	General Electric
1	125	2,300	1,800	D.S.C.	Fire pumps	General Electric
2	100	440		S.R.	Elevators	Lincoln Motor
12	25	440	1,200/900/600/450	D.S.C.	Stokers	General Electric
2	20	440		S R.	Coal larries	General Electric
6	7.5	440	1,200	S.C.	Sluicegates	Westinghouse
24	5	440	1,200	S.C.	Clinker grinder	Westinghouse
10	3	440	1,800	S.C.	Revolving screens	Westinghouse
4	t 230	440		S.R.	Gantry cranes	General Electric

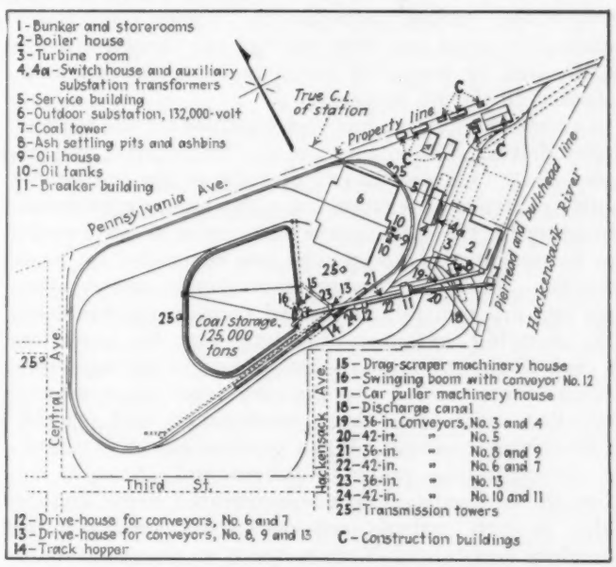
In addition to the centralized emergency control of the main steam valves, local opening and closing stations are provided near the individual steam valves and on the condenser-water lines.

Station-Power Service.—The station power is three-phase; with a few exceptions, it is 2,300-volt for motors of 50 hp. and over and 440-volt for motors under 50 hp. The power for the 2,300-volt buses, taken from the main-tie bus in the switch house, is stepped down by three 7,500-kva. banks of transformers located outdoors between the switch house and the turbine room; the power for the 440-volt buses is stepped down from 2,300 volts by six banks of transformers, of which two 1,000-kva. banks supply the turbine-room and boiler-house 440-volt auxiliaries, whereas four 300-kva. banks, not shown on the one-line diagram, supply the power for coal handling.

The main auxiliary substation is located in the turbine room below the operating floor on the side nearest the switch house. Either of two 2,300-volt main auxiliary buses, fed from the low-tension sides of the 7,500-kva. transformer banks, distributes, through oil circuit breakers, to twelve 2,300-volt group feeders, ten present and two future, and to the high-tension sides of the 1,000-kva., 440-volt transformer banks. These buses are sectionalized in such manner as to allow the low-tension sides of the 7,500-kva. banks to be isolated. Normally, however, two of these banks carry the entire load in parallel and the third serves as a spare. In this substation are also two 440-volt main auxiliary buses, which receive power from the two 1,000-kva. transformer banks and distribute to six 440-volt group feeders through truck-type panels. Both of these 440-volt buses are normally in service.

The twelve 2,300-volt group feeders and two of the 440-volt feeders supply group buses in the main auxiliary substation. The 2,300-volt group buses feed, through truck-type panels, three coal-handling substations and the auxiliaries of that voltage necessary for the four banks of boilers and the five turbines. The turbine-room cranes, the switch-house elevators and the various lighting transformers are fed from the two 440-volt group buses through oil circuit breakers.

Six group-feeder tie buses provide for carrying any group of 2,300-volt auxiliaries on an adjacent feeder in case of emergency and all group-feeder oil circuit breakers are designed to carry double load.



LAYOUT OF PROPERTY SITE FOR KEARNY STATION

Four 15,000-volt and two 7,500-volt truck-type panels are provided for emergency use and are normally placed in six of the eight spare housings.

The 440-volt boiler auxiliaries are supplied through oil circuit breakers located in two substations beneath the firing aisles. Each substation has three sections of

Oil Circuit Breakers

No.	Size Amp.	Volt	Type	Operation	Breaking Capacity, Kva.	Use	Manufacturer
5	3,000	25,000	F.H.K.-130–28B	R.C.	1,500,000	Generators	General Electric Co.
5	3,000	25,000	F.H.K.-130–28B	R.C.	1,500,000	Outdoor transformers	General Electric Co.
5	3,000	25,000	F.H.K.-130–28B	R.C.	1,500,000	Transfer bus	General Electric Co.
5	3,000	25,000	F.H.K.-130–28B	R.C.	1,500,000	Group-tie bus	General Electric Co.
3	3,000	25,000	F.H.K.-130–28B	R.C.	1,500,000	Station auxiliary transformers	General Electric Co.
2	3,000	25,000	F.H.K.-130–28B	R.C.	1,500,000	Group-tie and main-tie buses	General Electric Co.
2	3,000	25,000	F.H.K.-130–28B	R.C.	1,500,000	Group-tie bus sectionalizing	General Electric Co.
4	800	(6 C.T.)	F.H.K-0–39	R.C.	1,500,000	Outgoing lines	General Electric Co.
2	800	(6 C.T.)	F.H.K.-0–39	R.C.	1,500,000	Emergency on outgoing lines	General Electric Co.
2	800		F.H.K.-0–39	R.C.	1,500,000x	Bus tie	General Electric Co.
1	800	(6 C.T.)	F.H.K.-0–39	R.C.	1,500,000	Bus sectionalising	General Electric Co.
5	400	(6 C.T.)	F.H.K.-0–39	R.C.	1,500,000	High side of transformers	General Electric Co.
3	3,000	15,000	F.H.-206	R.C.	320,000	Main auxiliary bus, incoming lines	General Electric Co.
2	1,200	15,000	F.H.-203	R.C.	385,000	High side of H.S. transformers	General Electric Co
10	1,200	15,000	F.H.-203	R.C.	385,000	Group feeders	General Electric Co,
2	1,200	4,500	D-12	R.C.		Lines to 440-v. buses	Conduit Electrical Mfg. Co.
1	1,200	4,500	D-12	R.C.		Feeder to turbine room cranes	Conduit Electrical Mfg. Co.
9	400	4,500	E-4	R.C.		Auxiliary and lighting circuits	Conduit Electrical Mfg. Co.
4	1,200	4,500	D-12	R.C.		Incoming lines to 440-v. buses	Conduit Electrical Mfg. Co.
28	400	7,500	E-4	R.C.		Auxiliary and lighting circuits	Conduit Electrical Mfg. Co.
2	400	15,000	D-22	R.C.		Coal towers	Conduit Electrical Mfg. Co.
10	400	15,000	D-22	R.C.		Belt conveyors, etc	Conduit Electrical Mfg. Co.
5	1,200	15,000	D-13–B	R.C.		Generator neutral	Conduit Electrical Mfg. Co.
1	1,200	15,000	D-13–B	R.C.		Station ground	Conduit Electrical Mfg. Co.

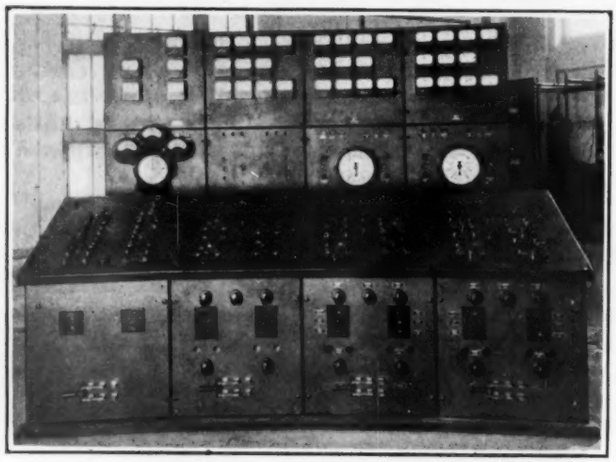
Transformers

No.	Type	Rating, Kva.	Voltage Primary	Voltage Secondary	Use	Cooling	Manufacturer
15	1φ	15,000	13,200	76,200 (132,000 Y)	Outgoing lines	O. I. S. C.	Allis-Chalmers Mfg. Co.
9	1φ	2,500	13,200	2,300	Auxiliary power	O. I. S. C.	Allis-Chalmers Mfg. Co.
6	1φ	333	2,300	460	Boiler house and turbine room	O. I. S. C.	General Electric Co.
12	1φ	100	2,300	460	Coal handling	O. I. S. C.	General Electric Co.
3	1φ	75	440	220 (110 three-wire)	Lighting	O. I. S. C.	Allis-Chalmers Mfg. Co.
2	1φ	37.5	440	220 (110 three-wire)	Lighting	O. I. S. C.	Allis-Chalmers Mfg. Co.
2	1φ	10	440	220 (110 three-wire)	Lighting	O. I. S. C.	Pittsburgh Transformer Co.
1	1φ	5	440	220 (110 three-wire)	Lighting	O. I. S. C.	Pittsburgh Transformer Co.

buses, which may be connected to either or both of the two group feeders from the main auxiliary substation.

Motors and Their Controls.—With few exceptions, the motors driving auxiliaries in the Kearny station are of the double-squirrel-cage type, with standard open horizontal construction, and are remotely controlled. The motors for operating the condensate pumps, air pumps, fresh-water pumps, ash-sluicing pumps, salt-water pumps, fire pump and dock winches are thrown directly on the line by means of remotely controlled solenoid-operated oil circuit breakers.

Multispeed operation has been provided for the fan and stoker drives. The motors for the forced draft and induced draft fans are thrown directly on the line by remotely controlled breakers, but pole changing switches, providing for the operation of each motor at two speeds, are located at the motors and are controlled by push buttons. The stoker motors have double stator windings and are remotely controlled from drum controller pole changing switches providing for the operation of each motor at four speeds. The circulating-pump motors, which are of the slip-ring type, are remotely controlled, with time-limit acceleration and special under-voltage features. When any line switch is closed, the corresponding motor is automatically brought up to speed by means of a motor-operated drum switch which, in turn, controls contactors short circuiting the secondary resistance. Each motor is so connected as to



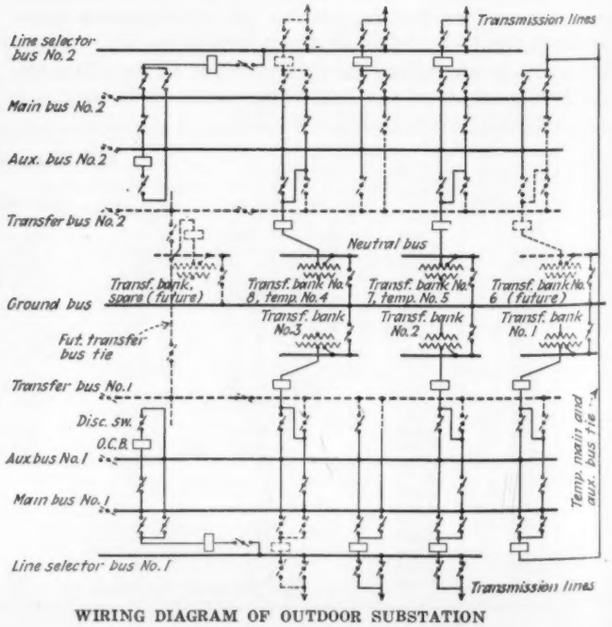
SECTION OF BENCHBOARD IN MAIN CONTROL ROOM

stay on the line under all low-voltage conditions, two steps of secondary resistance being cut back in at 50 per cent voltage and the entire secondary resistance at approximately 10 per cent voltage. The motors for operating the air compressors are of the synchronous type, with squirrel-cage starting windings. Each motor is thrown directly on the line by a remote oil circuit breaker, and a relay, acting after a given period of time, causes the motor field to be energized.

The feeders to all the crane, elevator and coal-larry motors, all of which are 440-volt, are equipped with remotely controlled solenoid-operated breakers. The turbine-room cranes are provided with drum controllers and resistors for motors of 50 hp. and under, and with master controllers, contactors and resistors for those over 50 hp.; all these motors are of the slip-ring type. The motors for the boiler-feed pumps are operated by Ruggles-Klingemann differential-pressure regulators applied to their controllers. The ash-pit gantry crane is provided with drum controllers for the bridge and trolley motors, and a magnetic controller for the hoist motor. The sluicegates are opened and closed by remotely controlled reversible motors. "Urelite" safety switches are used to operate the revolving-screen and clinker-grinder motors, and fused safety switches are used on the various oil-pump motors.

Outdoor Substation of 132,000 Volts.—The entire station output is carried to the outdoor substation from the switch house in five fibre-duct lines, one per bank of transformers. Each duct line contains four 1,000,000-circ.-mil "Kerite" cables per phase. The voltage is here stepped up to 132,000 volts for transmission purposes.

The transformer banks have been placed in two parallel rows down the center, the underlying idea being to have each of the two rows feed the transmission lines radiating from its half of the substation. The buses are arranged on two main elevations above the transformers. Five 45,000-kva. banks of Allis-Chalmers transformers have been installed, each bank consisting of three 15,000-kva. single-phase oil-immersed self-cooled units. The high-tension side of each bank is star-connected; the low-tension side, delta-connected. The neutral point of the high-tension side is normally dead-grounded.



WIRING DIAGRAM OF OUTDOOR SUBSTATION

A main bus and an auxiliary bus are provided for each half of the substation and can be tied together in each instance through an oil circuit breaker. Also installed in each half of the substation is a line-selector bus, by means of which the corresponding spare high-tension-line breaker can be substituted for either of the line oil circuit breakers. This arrangement of high-tension buses, all of which consist of 500,000-circ.-mil. cable, precludes the necessity of connecting together more than three banks of transformers and therefore permits the outdoor oil circuit breakers, which have a rupturing capacity of 1,500,000 kva., to handle successfully all short-circuit currents. In the ultimate installation there will be bus-sectionalizing oil circuit breakers in both the main and auxiliary buses in both halves of the substation, and the connection between the two halves of the substation will be so constructed that both main buses and both auxiliary buses can be tied together without interconnection on either side.

Switchboard Panels

Main Control Room

Number Installed	Space Provided for Future	Type	Use
5	5	Benchboard	Generator control
1	0	Benchboard	Signal control
1	1	Benchboard	Main-tie-bus control
(two-circuit)	(two-circuit)		
1	0	Benchboard	Spare-exciter control
5	6	Benchboard	Transformer control
2	4	Benchboard	High-tension-line control
(two-circuit)	(two-circuit)		
1	2	Benchboard	High-tension-bus control
5	5	Vertical	Generator instruments
1	0	Vertical	Signal instruments
1	1	Vertical	Main-tie-bus instruments
1	0	Vertical	Spare-exciter instruments
5	6	Vertical	Transformer instruments
2	4	Vertical	High-tension-line instruments
(two-circuit)	(two-circuit)		
1	2	Vertical	High-tension-bus instruments
5	5	Vertical	Generator recording instruments
1	0	Vertical	Totalizing wattmeter
1	0	Vertical	Recording voltmeter
2	2	Vertical	Direct-current distribution
0	4	Vertical	Miscellaneous recording instruments
5	6	Vertical	Generator and transformer temperature indicators
3	3	Vertical	Station-power-transformer control
2	2	Vertical	Transformer differential relays

These panels are made of ebony asbestos.

The oil circuit breakers and disconnecting switches in the outdoor substation are controlled from the main control room. All of the oil circuit breakers, except the two for tying together the main and auxiliary buses in each half of the substation, are equipped with bushing-type current transformers. These current transformers, together with the necessary relays in the two outdoor relay houses, provide for differential protection of the transformers and automatic operation of the line oil circuit breakers. The disconnecting switches are of the motor-operated double-break horizontal-opening type, with their blades mounted on the center stacks of insulators and rotating on ball thrust bearings.

Interlocking of the 132,000-Volt Equipment.—Each of the four line oil circuit breakers and the two spare line oil circuit breakers is interlocked on one side with its isolation disconnecting switches in such a manner that the switches are locked either open or closed by the closing of the oil circuit breaker. In each half of the substation the oil circuit breaker in the tie between the main and auxiliary buses is interlocked with its two sets of isolation disconnecting switches so that neither of the sets can be operated when the breaker is closed.

In addition, each of the four line oil circuit breakers and the two spare line oil circuit breakers is interlocked on the other side with its selector disconnecting switches in such a manner that, if the sets of disconnecting switches to the main and auxiliary buses are both open, they are locked open by the closing of the oil circuit breaker, and if either of these sets is closed, it is locked closed by the closing of the oil circuit breaker, but the closing of the set of disconnecting switches to the other bus releases the lock and the set remaining closed is locked. The two sets of selector switches for each transformer oil circuit breaker, and the four sets for the oil circuit breaker in the temporary tie between the two halves of the substation, are also interlocked with their respective breakers in the same manner.

Neither of the two spare-line oil circuit breakers can be closed if more than one of its sets of line-selector disconnecting switches is closed, and the closing of the corresponding oil circuit breaker locks that set closed and the other set open.

In each tie between main and auxiliary buses the oil circuit breaker is provided as a precaution against rupturing current with a selector disconnecting switch when transferring from one of these buses to the other.

Proposed High-Tension Transmission.—A total of 100 miles of high-tension transmission lines and nine 132,000-volt distribution substations are included in the proposed development of the Public Service Electric & Gas Company. Two 132,000-volt two-circuit transmission lines have already been constructed from the outdoor substation at Kearny to the Essex and Marion stations, respectively. Provision has been made for the installation of lightning arresters on these lines, but they have not been considered necessary at the present time.

Designs and specifications have been prepared for the construction of three of the nine substations. Two of these substations are now under construction, one in Passaic and one in Trenton. Connection will be made at the latter place with the Philadelphia Electric Company's lines; these will at first be operated at 66,000 volts but will ultimately be raised to 132,000. At Philadelphia a 24,000-volt submarine connection with Camden is now maintained.

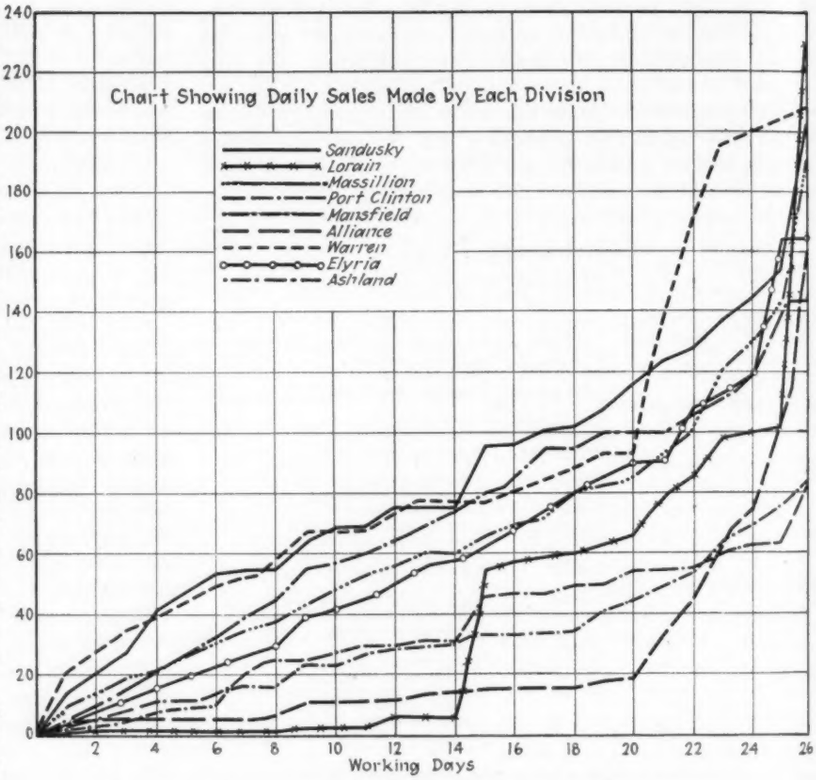
The high-tension transmission lines eventually spread across the state will take approximately the form of the letter "P" turned over and laid on its side and will carry practically all of the system load not fed radially from generating stations. The loop portion will encircle about one-half of the load and the tail will extend at least as far as Trenton. The completion of the loop portion, because of the densely populated territory to be traversed, is dependent to a certain extent upon the development of 132,000-volt cable.

It is expected that the plan outlined above will provide every facility for system growth during the next ten years. The proposed locations of the lines and substations are such that they will readily admit of interconnection with other systems at all practicable voltages, ties at 26,400 volts having been already established with the Staten Island Edison Company and with the Jersey Central Power Company. Both the loop and the tail of the system will make large blocks of power available at points likely to be used for the supply of energy to such railroads as may be electrified in the future. After the second half of the Kearny station has been built and outgrown, it will be possible to locate new generating stations so that their output can be fed directly into the high-voltage transmission lines then extending across New Jersey.

A Record in Electric Refrigeration

Ohio Public Service Company Attains 2.3 per Cent Saturation of Customers—Experience in Selling and Installation—Definite Plan of Sales Organization

ELECTRIC refrigeration as means of extending the utilities' service in the home and at the same time building up the gross revenue per domestic customer has commanded a great amount of attention from central-station men during the last two years. There has been much speculation as to the probable percentage of residence customers that could be considered bona fide prospects for electric refrigeration, what kind of sales plan would be most effective and how extensive a service and installation department is required. Many of these questions are answered in a practical way in the experience of the Ohio Public Service Company, which conducted intensive 30-day sales campaigns on its various divisions in the first six months of this year, resulting in the sale of electric refrigeration units to 2.3 per cent of its domestic and commercial customers. This is believed to be the highest percentage of saturation yet reached in the development of this class of business.



DAILY SALES AND TRIAL INSTALLATIONS OF ELECTRIC REFRIGERATORS, NINE DIVISIONS OHIO PUBLIC SERVICE COMPANY

The campaign was under the direct supervision of C. L. Dunn, general new-business manager of the Ohio Public Service Company, who, preliminary to starting operations, made a careful study of conditions in each division, setting up sales quotas and organizing the company's sales and service departments to handle the work.

Sales of electric refrigerators by the company's nine divisions in 1925 were 564 units, totaling about $198,000. The estimated annual revenue, based on an average of $30 per unit, was about $17,000. This year 1,488 units, totaling approximately $520,000, with an estimated annual revenue of about $45,000, were sold in only 26 working days per division. This means an increase of about 265 per cent over the total sales for 1925.

The campaign was divided among the nine divisions of the company, and quotas were set according to the customers each division handled on a basis of 1.77 per cent of the domestic and commercial customers.

The plan was first tried out on two divisions, Mansfield and Elyria, where the campaigns lasted 26 working days. This was done with the thought of giving the campaign a fair trial. It was decided that the results which these two divisions obtained would determine the possibilities of the remaining seven divisions.

The campaign of the two divisions started on Feb. 15 and ended on March 15, making a total of 30 days, or 26 working days. The purpose of the campaign was to educate customers in the advantages and economy of electric refrigeration over the old method of melting ice. The proposal offered to the public was, first, free trial demonstration without obligation to buy; second, maximum time for customer to make first payment, and third, special winter or early spring offer, so customers could get delivery with better service than would be possible during the spring or summer rush.

The operation of the campaign was dependent entirely on personal solicitation, and every salesman had to do his part. Each was given a fair quota and was responsible for securing enough prospects to enable the quotas to be sold. Two refrigeration salesmen were furnished by the manufacturers to assist in closing sales and also call on prospects when requested by salesmen.

A considerable amount of advertising was planned, including newspaper, direct mail to a selected list of prospects, painted banners placed on all cars and trucks and street car cards, both inside and out. Approximately 2 per cent of total sales was spent for advertising, and careful thought was given each expenditure in order to determine whether it was justified.

During the period of the campaign prizes were offered to the division salesman for selling or turning in

prospects that resulted in the largest number of units sold. The prizes ranged from an electric refrigerator unit down to a trip to the manufacturer's national sales convention.

The success of the campaign was largely determined by the thorough organization back of it. Plans were carefully laid, and each man was given a definite part of the program which he determined to put over. The results show the genuine enthusiasm in this sales campaign.

The first chart shows the steady upward trend of sales made by the two divisions. It is well to note that the sales of both divisions rose steadily for the first 24 days, then an upward rush occurred on the last two days. This is due to the fact that during the first part of the campaign quite a number of machines were put on free trial, as is shown on the second chart, and then as the campaign was drawing to an end more effort was put upon the sales of the machines left for trial.

The campaign was terminated on the date set, March 15, and the results from these two divisions exceeded the quotas. The average percentage for the two divisions based on their given quota was 112 per cent. The total sale of units for Mansfield, serving a total of 9,413 customers, both domestic and commercial, was 143, and total sales for the Elyria division, serving a total of 6,635 customers, was 163 units.

Based on the sales by these two divisions, a similar program was put on by the seven other divisions and the campaign was started on April 1 and run through to May, making a total of 30 days, or 26 working days. The results were extremely satisfactory, amounting to 1,182, or 1,488 for the entire campaign, approximately 2.3 per cent of the total domestic and commercial customers.

In reviewing the different phases of selling electric refrigerators Mr. Dunn emphasized the necessity for a thorough organization both of the sales and installation departments. Each division has one salesman and one service man who have gone through two weeks' special training at the manufacturer's plant. This gives each division two men who may be called electric refrigeration experts. During the campaign salesmen from every branch of the new-business department—about 100 in all—participated in the selling activity. Commissions were paid to all, depending on the amount of assistance given by the refrigeration department salesmen. Factory salesmen were also furnished by the manufacturer and they proved extremely valuable in training the company's own men and in helping to close sales.

Outline of Summer Refrigeration Campaign for All Divisions of the Ohio Public Service Company

Purpose:

1. Again to impress forcefully on the minds of customers why they should have electric refrigeration installed from the standpoint of health, convenience and economy.
2. To make it possible for O.P.S. to sell 3,000 units this year.

Proposition:

1. Free trial demonstration without obligation to buy.
2. One-twenty-fourth of total bill to be minimum first payment, or total bill divided into 24 equal payments.
3. Special hot weather offer in order to help customers secure better refrigeration.

Operation:

The operation of the campaign will depend largely on personal solicitation and every salesman is asked to do his part, which is to sell his quota. All new-business salesmen will be allowed to participate and share in the extra commissions in proportion to the number of units sold.

Advertising:

Newspaper copy, similar to that used in last campaign, will be prepared for use in this campaign. Newspaper ads should be strengthened by the use of direct mail to a selected list of prospects, painted banners placed on all cars and trucks, street car cards and any other form of advertising that will help get the advantages of electric refrigeration forcefully before all electric customers. Two per cent of total sales should be spent for advertising and careful thought given each expenditure in order to determine whether it is justified.

Selling Prices:

Use factory list prices plus installation charges and delivery. Add 8 per cent for two years' time. On any sales, if customer makes cash payment of 10 per cent or more of total bill, same should be deducted before interest charges are added.

Quota (by divisions):

Warren	96	Elyria	59
Mansfield	83	Ashland	27
Lorain	79	Port Clinton	23
Alliance	73		
Massillon	72		
Sandusky	62	Total	574

The quotas are to be divided on a fair basis among the salesmen.

Commissions for Each Special Refrigerating Salesman:

Ten per cent on all personal sales regardless of number of units sold; 1½ per cent on all units sold by other employees. If division reaches its quota, a commission of 2 per cent will be allowed on all units sold and installed during the period of the campaign. A $50 prize will be given if division reaches its quota.

Representatives' Commission:

Six per cent on all personal sales; $7 extra for each unit sold if department reaches its quota. A $50 prize to salesman selling largest number of units.

Commission to Floor Salesmen:

Regular ½ of 1 per cent of sales; 50 cents extra for each unit sold if department reaches its quota. All commissions paid on cash price of unit installed and extra commission paid only on units installed and charged and sold during period of campaign.

Results from Campaign if Quota Is Reached:

574 units at $350 each			$200,900
Cost of 574 units f.o.b. factory		$129,466	
Delivery and installation ($20 each)		11,480	
Total sales commission (12 per cent)		24,108	
Extra prizes		1,737	
Advertising		4,018	
		$170,809	
Credit from manufacturers (one-third advertising)	$1,336		
Installation expenses	1,400		
Credit for prizes from distributors	1,325		
Manufacturers to furnish service (9 men) for 30 days (no charge)		4,061	
Net Cost			$166,748
Profit (20 per cent) or			$34,152

Annual Estimated Revenue:

574 units at $30 each $17,220

Some apprehension was felt at first in offering free trial installations, but it soon developed that once the customer had used electric refrigeration he was extremely loath to have it removed. This was particularly true where the unit had been put in his own refrigerator box. For the entire campaign in all divisions only 6 per cent of the refrigerators placed on trial were finally removed.

The chief problem encountered was that of installation. Two men working together were able to complete on the average two installations per day and in some instances three, but it was decided not to hurry the work, as satisfactory operation depended largely on careful work when the unit was first installed. All units were "frozen up" before being delivered, so that the customer would have refrigeration as soon as the

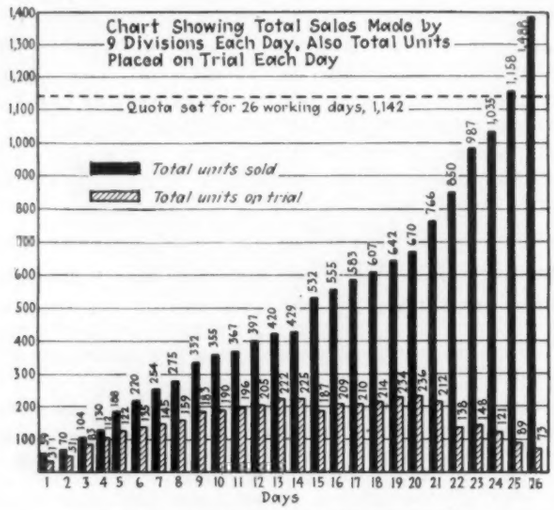


Chart Showing Total Sales Made by 9 Divisions Each Day, Also Total Units Placed on Trial Each Day
Quota set for 26 working days, 1,142
Total units sold
Total units on trial
Days

CHART OF DAILY SALES BY DIVISIONS

installation was completed and the service man or trained refrigerator salesman called back again to see that the machine was functioning properly. Very little difficulty was experienced in the way of complaints, most of the calls coming from customers who were not yet familiar with the starting and stopping periods of the compressor.

Wherever possible, on domestic installations the compressor was installed in the basement or cellar. This was done primarily because usually a better circulation of air at 10 to 15 deg. lower temperature was available in the cellar than in the kitchen. It also eliminated the possibility of noise from the operation of the motor in the kitchen. The accompanying tabulation shows the percentage of remote jobs, self-contained units and commercial units sold. In Mr. Dunn's opinion the remote installation of the compressor is most desirable in the home, and he mentioned that on a number of self-contained units the compressor had been removed to the basement after it had been in use a few weeks.

It will be noted that the sale of commercial units represents 34 per cent of the total sales, whereas the domestic type represents 66 per cent, showing that, in relation to the number of customers in each class—about 8,000 commercial and 62,000 domestic—sales to the commercial customers are much higher. However, this cannot in any way be construed as a criterion for the number of residential customers who may be considered likely prospects for electric refrigeration. By the end of this year the Ohio Public Service Company expects to have sold domestic refrigerators to about 4 per cent of its residence customers, and Mr. Dunn states that his company's ability to develop sales depends almost entirely on the number of capable salesmen that can be made available. At present the company has twelve special refrigerator salesmen to cover 62,000 residential customers, or about 5,000 customers per refrigerator salesman. To cover this territory properly each such salesman will be assisted by a territory representative having not more than about 1,500 customers. Also, although it has been the general impression that families with incomes of $5,000 or more annually could be considered legitimate prospects, this has not held true in this case, as there were a number of cases where households with incomes ranging between $2,400 and $3,000 bought electric refrigerators. Mr. Dunn estimates that under existing conditions of price and deferred payments between 25 and 30 per cent of his company's customers may be considered as good prospects.

TYPES OF ELECTRIC REFRIGERATION UNITS SOLD

Division	Remote Jobs, Per Cent	Self-Contained Jobs Per Cent	Commercial Jobs Per Cent
Warren	42	28	30
Lorain	6	39	55
Elyria	55	20	25
Alliance	32	54	14
Ashland	10	20	70
Port Clinton	10	68	22
Massillon	47	33	20
Sandusky	41	30	29
Mansfield	26	42	32
Total	30	36	34

Note: Total sales 1,488 units.

As stated, the Ohio Public Service Company plans on selling electric refrigerators to 4 per cent of its residential customers by the end of 1926. To reach this a second sales program was opened in July and August. With some modifications it is similar to the first campaign, and because of the unusually successful results which have been attained the essential details of the plan are given in outline here. At a gross annual revenue of $30 per unit the sale by the Ohio Public Service Company of 564 electric refrigerators in 1925 and 1,488 units so far this year means a total increase in gross annual revenue of $61,640 from this source alone.

Water-Power Utilization in Germany

UNDER the auspices of the German and Bavarian governments and the Kaiser Wilhelm Society, a new Water Power Utilization Research Society has recently been formed in Germany. It is proposed to establish a special laboratory on the banks of Lake Walchen, in Bavaria, where research work of all kinds in connection with the economical utilization of water power will be studied, including such questions as the effect of flowing water on riverbeds, the design of dams, the most suitable forms of canals, piping and other conduits. The new association will have the advantage of making practical tests at the large and important hydro-electric station which has lately been completed on Lake Walchen. It is estimated that in Bavaria alone there is still about 2,000,000 hp. of water power waiting to be utilized, and with an equal quantity available in other parts of Germany it is estimated that by utilizing this it would be possible to effect an economy in coal consumption of 20,000,000 tons per year.

Cost Analysis for Electric Utilities

Affords Health Charts for Executives to Measure Business Trends—Gives Guides to Profit or Loss on Classes of Business—Useful in Making Rate Schedules to Develop Business

By COL. C. F. LACOMBE
New York, N. Y.

THE light and power industry has reached a stage of development at which it is important that it study its business by classes to determine how to build for better business and more business. The editors have asked Col. C. F. Lacombe to present in three articles his best thinking for setting the industry to work on a constructive program of study whereby existing prosperous conditions will be maintained in the future.

Colonel Lacombe is a pioneer in the industry, with a wide and varied experience as contractor, engineer, consultant and executive. He was associated with early power and transmission developments in the West and later served for twelve years as the chief engineer of electricity and gas for the greater city of New York. During the war, he entered the engineer branch of the army and was made executive assistant to the Power Director of the United States and did notable work in that capacity. For the last few years he has devoted much time and study to the economics and statistics of light and power utilities. He has been a member of the rate committee of the Association of Edison Electric Illuminating Companies for some years and has made an intensive study of the utility business from the executive standpoint. These articles should serve to give the industry some very valuable aid and counsel.
—*The Editors.*

THE sales of electrical energy in this country are not keeping pace with the increasing investment of dollars in plant and equipment or with the increase in generating capacity, and further, this unbalanced development may unfavorably affect any industry's prosperity and retard its growth, if prolonged. This was pointed out by Samuel Insull, president of the Commonwealth Edison Company of Chicago, in an address given at the recent convention of the National Electric Light Association. Very significant figures showing the lack of increasing sales to balance the increased investment and capacity are given in Mr. Insull's address as reported by the ELECTRICAL WORLD. One point of particular interest is that the average lighting usage per customer throughout the industry, including all classes of lighting customers, is now 10 per cent less per customer than in 1923, although it had been increasing up to that year.

Lighting of all kinds undoubtedly furnishes the bulk of the business of the industry, and this fact makes his statement a most important one, in that he points out that in many cases the lighting business must be below what it should be, because of the known high usage in a number of localities. Attention is further drawn by Mr. Insull to recent surveys showing an intimate relation between rates and use of energy by residential customers.

He then suggests the great opportunities existing for increased business by proper attention to rate systems and a study of selling prices and rate structures, with systematic sales campaigning, resulting in a possible increase in load factor.

The late Mr. Coffin at a series of conference lunches given last winter had drawn attention to the same general problem, with particular reference to the great possibility of increasing residential usages, thereby adding to the return per dollar of the present investment in this service, by the use of major domestic appliances such as refrigerators, ranges and water heaters. The history of the industry has shown that low prices per kilowatt-hour are required for the use of these energy-consuming devices.

The most successful and soundest method of encouraging increasing use of a service, particularly at retail, is the same as the age-old practice in increasing sales of commodities and may be called an inducement form of rate. In other words, a rate providing decreasing prices per unit with increased usage, and usually in the form of the higher price for a limited amount of energy first used, then followed by a much reduced price for all energy used beyond the first amount. Such a rate must closely follow the costs of service at varying load factors, as will be shown in a later article.

It is obvious that the right way to reach the objective of increased service by correctly constructed rates is through a close knowledge of costs of service under varying conditions of usage. This can be obtained only through an adequate and thorough cost analysis. The ELECTRICAL WORLD has repeatedly pointed out the possibility of increasing the use of energy so that higher returns can be earned per dollar now invested, and it has also emphasized the necessity of complete cost analyses as well as their general use as a guide to correct rates. There is no doubt that this solution is sound, for rates based on incorrect or incomplete costs will produce unfortunate results to both company and consumer.

It should be emphasized that cost analysis is a guide or base for rate structures, but cost alone is not necessarily the only consideration in making rates or prices. Many other factors and selling considerations affect prices, and engineers and statisticians should not be allowed to regulate price schedules on the cost elements alone. At the same time, the most common error in making rates without knowledge of costs must certainly be avoided in any case.

Several public utility companies have used such analyses for a number of years, with the result of increased load factor from a well-designed schedule of rates of the inducement form to the general satisfaction and

COMPARISON OF INVESTMENT AND RETURN BY CLASSES OF SERVICE, COMPANIES "A" AND "B," YEAR 1924, AS DEVELOPED FROM COST ANALYSES

Company "A"

Group Classification	Total Investment Responsibility	Per Cent of Total Investment	Annual Gross Revenue	Per Cent of Gross Revenue	Net Return*	Per Cent of the Total Return Earned by Each Class	Per Cent Return Earned by Class on Investment
Residence lighting	$21,650,000	36.1	$6,708,900	33	$1,299,000	21.56	6.0
Commercial lighting and retail power	22,160,000	37.0	7,522,100	37	2,991,600	49.8	13.5
General wholesale†	16,190,000	26.9	6,099,000	30	1,709,400	28.64	10.5
Totals	$60,000,000	100.0	$20,330,000	100	$6,000,000	100.0	10

Company "B"

Residence lighting	$20,900,000	38	$4,120,000	32.40	$836,000	18.4	4
Commercial lighting and retail power	24,200,000	44	6,303,600	49.50	2 904,000	64.0	12
General wholesale†	9,900,000	18	2,306,400	18.10	797,500	17.6	8.06
Totals	$55,000,000	100	$12,730,000	100	$4,537,500	100	8.02

*"Net return" is gross revenue minus total allocated cost to serve, exclusive of dividends or interest on funded debt — that is, net return equals amount available for interest, dividends and surplus. †"General wholesale" includes wholesale low and high tension, municipal, special industrial and off-peak business

increased convenience of the consumers. Such rates result in a low unit price when applied to domestic service, and, as Mr. Insull remarks in the address referred to: "Companies with low residential rates and the higher usage, the better balance sheets, better public relations and altogether were in a healthier condition."

Thorough cost analyses are of infrequent occurrence, however, among utility companies in spite of their great practical usefulness. This usefulness is not generally known or appreciated, and this article has been written for the purpose of setting out the importance of cost analysis, the many valuable uses that can be made of it and the basic economic data that can be drawn from it.

USUAL BALANCE SHEET NOT SUFFICIENT

The usual balance sheet is familiar to all concerned with investment and revenue matters and gives the over-all results, which are usually considered sufficient. It is very satisfactory to see, for instance, that a company is earning 10 per cent on its entire investment, but this does not show how it is earned, which classes of business are most or least remunerative, whether one class is earning more or less than its equitable portion of the whole revenue, where the most promising growth is coming from, what is the trend of growth in the several classes, and many other comparisons of the relative revenue values of the earnings of the different classes of customers and of the dollars invested for the use of each class.

From the successes of the class businesses comes the continued success of the business as a whole. The class successes, or earnings, depend on the prices at which the service is sold and the amount sold. Assuming these, the profit or loss of the rate depends then on the cost of the service, and that can only be accurately determined by cost analysis.

The fundamental basic result of an adequate and intelligent cost analysis is the establishment of the investment in dollars devoted to each class of service over the entire system. This analysis must be so built up and segregated that the costs can be established at the material points from the busbars of the generating station through the transmission and distribution systems. From this may be determined the number of dollars invested in each class of business, from the largest wholesale or other utility customer to the residential class. The cost of readiness to serve, energy costs and other items are analyzed in the same manner. From the revenue returns the gross revenues of the classes are known, and by subtracting from these the properly allocated expenses, there is left the net or actual rate of return earned from each class, thus demonstrating whether it is above or below the equitable and necessary rate of return that this class should earn.

By continuing the analysis for consecutive years the trend of any class of business can be shown clearly. It will be seen, then, that a base analysis is obtained, by which standard any class of service and its earnings can be compared and measured from year to year and future developments predicated.

USES OF COST ANALYSES

An analysis of cost is thus established that will furnish the administration of a utility with reliable information of the actual sources of income not revealed by the usual financial reports. It is self-evident that this must be of great value in the proper conduct of the utility in reference both to its stockholders and to its customers. Some of the individual useful purposes served by such an analysis may be summarized as follows:

First. — **Segregation of Present Investment.** — It establishes a base analysis of investment and production costs of such a structure that these costs can be built up and segregated step by step from the generating station busbars through the system to the individual customer or class from the largest wholesale user to the average of the smaller of the residential customers. This standard base improves in accuracy and increases in value as each year's business is analyzed and adjustments are made for changing conditions.

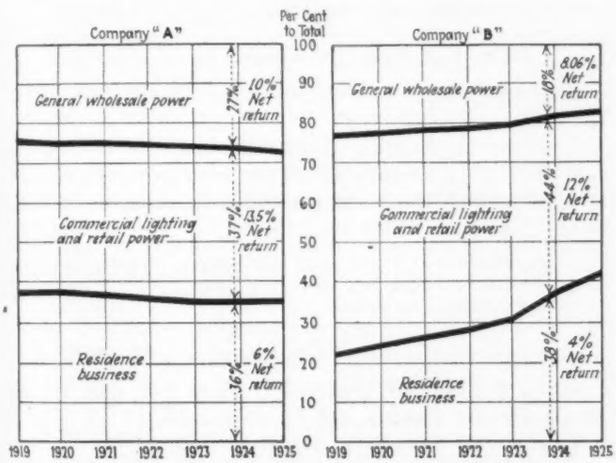
Second.—**Cost of Service for Each Class.**—After these costs are established, the gross returns of each class are set up against them, and this comparison forms a gage by which the net returns of each rate can be analyzed, examined and compared with their established costs to serve and the net earning power determined at any load factor.

Third.—**Assignment of New Investment.**—This, in turn, will show which class investment is annually earning the most per dollar, which classes of business need development in earning power, where new investment dollars can be placed to best advantage, and in which classes intensive and efficient sales effort is most needed. It will show what types and amounts of industrial business, particularly that with off-peak characteristics, can be taken on with the best effect on the system load factor and with the least danger of distor-

tion or disturbance of revenues due to industrial booms and depressions.

Fourth.—**Stabilizing the Net Return of System.**—In the making of rates the analyses of cost will furnish a guide in the form of a design rate, built up from the elements of cost, which can be adjusted to the requirements of commercial policy, economics, public relations, development or creation of new classes of business, improvements of load factor, etc., necessary to gain the desired results. By this means a proper balance of investment and gross revenue may be built up between the several classes of business that will prevent the excessive development in per cent of total investment or gross revenue of a class of service of low earning power. This may be done by a form of rate encouraging increased usage and consequent higher return per dollar invested. This analytical guide can further be used in directing special sales effort toward increasing the returns from those classes the gross revenues of which are least subject to fluctuation. This will tend to stabilize the total system return.

Fifth.—**Predicting Future Return on Class Investment.**—It will definitely show the present trend of



TREND OF INVESTMENT BY CLASSES FOR COMPANIES "A" AND "B," 1919-1925

each class of business from its past characteristics, on which trend the immediate future results can be predicted and somewhat controlled. Extended over several years, this will show the real trend of growth of the business, not the mere over-all average earnings. It will show whether the company's returns are or are not improving with growth in customers and system demand.

Sixth.—**Balancing Gas and Electric Investments.**—In combined gas and electric utilities it will readily show the best and most profitable lines of development on which to expand the use of either service and whether gas or electricity can be applied most economically and commercially to the various types of the domestic and industrial requirements of the community.

Seventh.—**Value of Cost Analyses to Holding Companies.**—To holding companies analyses of cost and earning power will give a ready comparison between different policies of administration, types of service and sales effort in use in the individual operating companies. In addition, they will give a comparison of the relative returns that may be obtained from the application of electric service to different types of industry prevailing in the various communities served. In this way they may also serve as a guide in directing the flow of investment, not only in the individual company but as between several companies.

Eighth.—**Preparedness for Rate Cases.**—In rate cases a knowledge of the apportionment of costs and the relative returns will give the sound reasons behind the rates as designed on correct and equitably allocated elements of investment, readiness to serve, energy and all other costs. Such rate development also will explain the commercial, economic and load development factors used in reaching the published rate form. Such an exposition based on the experience and sound practice of utilities of known equitable and successful rate policies would be thoroughly convincing, susceptible of easy economic proof and of great value in establishing definite rates of return as required by proven costs.

In general, the important result cost analyses will bring out is the investment responsibility and production costs of each class of business, and from this can be determined the necessary rate of return to be earned, equitably but not necessarily equally, by the respective classes of service in order that each should contribute as nearly as possible its proper share of the fixed and dividend charges, including reserves, etc., as required by its proportion of the business and its use of invested dollars.

These analytical methods will put the utility business on the same sound basis of cost analysis as that of the great department stores, which have to determine the costs and selling prices of many articles almost every day and week.

ILLUSTRATIVE EXAMPLE CITED

In order to demonstrate the preceding statements by an illustrative example, the following is given, derived from actual conditions in several known cases:

Two analyses are submitted of the same year for two companies, fairly comparable as examples of differing practices of economic development in two cities of similar industrial type. One, Company "A," the larger of the two, has used annual cost analyses as a guide in the cultivation of its business. The other, Company "B," has not, but an analysis has been made of it. Both companies have grown rapidly in size since 1918 and although "A" has more residence customers than "B," it has not increased the number in this class as rapidly as the latter company.

The accompanying table shows the relative results of total and individual class earnings in two tables, one of Company "A" and one of Company "B."

The illustration shows a trend chart of the investment by classes in these companies from 1919 to 1924 inclusive. Although annual analyses for the entire period are not available for each company, several analyses were obtainable in the later years to establish the data shown. Earlier years of this chart of trend of investment are derived from trends of gross revenue and other reports supporting the results as shown for the main classes of business.

Referring to the table, it will be noted that Company "A" has a total investment in its main classes of $60,000,000, on which it earns a 10 per cent over-all net rate of return. The figures for the respective classes show that about 73 per cent of the total investment is almost equally divided between the residential class and the commercial lighting and retail power business. On its portion the residential business earns 6 per cent, and

the commercial and retail power class earns 13.5 per cent on its investment. Although the residence rate does not reach an 8 per cent return, it is remunerative, considering the factor of public relations affecting it. This 6 per cent return is obtained by an inducement form of rate which decreases the price per unit with increasing use and has developed a usage of about 500 kw.-hr. per year per customer. The same rate is used for commercial lighting, but with a proper increase of demand qualifications. The ratio of the earnings on this class to those of the residential class is not high when the value of the service and its economical relation to the latter rate are considered. The return on the general wholesale or industrial class is in good proportion to the commercial rate of return. It is known from other data that in this company the investment in this class of business, the earnings of which are subject to business fluctuations, has been carefully controlled, although the net returns from this class have materially increased over previous years, due probably to the development of off-peak business.

In comparing the figures for the investment and earnings of each class, it should be noted that in residence business 36.1 of the investment earns 33 per cent of the gross revenue and with a 6 per cent return, but it earns 21.5 per cent of the total net return. The commercial class uses 37 per cent of the investment, earns 37 per cent of the gross revenue and contributes 49.8 per cent of the net return. The wholesale class uses 26.9 per cent of the investment, yielding 30 per cent of the gross revenue and 28.6 per cent of the net return.

Again referring to the table, Company "B" is found to have a total investment of $55,000,000 for its three main classes of business, on which it earns 8.25 per cent over-all net rate of return. Of the investment 82 per cent is in the residential and the commercial lighting and retail power classes. The residential business earns 4 per cent net return and the commercial, etc., 12 per cent on their respective investments. The residential and commercial lighting rates are the same and practically have the characteristics of a straight-line, non-inducement form of rate. The retail power rate is of the same general form, but lower. The residential average usage is about 330 kw.-hr. per year, and this usage is increasing very slowly.

The number of residential customers has increased rapidly in late years, and, as seen by the trend chart, this class has absorbed an increasing proportion of the total investment and returns a considerable percentage of the gross revenue, which, however, yields only 4 per cent net return on the dollars invested.

The figures for the residential business further indicate a high average price per kilowatt-hour without any inducement for increased use or an improvement in load factor. It is generally admitted that a high, almost constant rate does not encourage an increased use of energy, and in consequence, with a limited use and a constant price, one can expect only a very slowly increasing rate of return from this class of business. It is seen from the analysis that the commercial lighting and retail power business uses the largest proportion of the investment and returns practically 50 per cent of the gross revenue, with 12 per cent net return on the investment.

The general wholesale power business has a relatively small investment and gross revenue in per cent of the whole, earning 18 per cent of the gross revenue and about 8 per cent net return per dollar invested.

It is seen at once by this analysis that 64 per cent of the net return is earned by the commercial lighting and small power class; that the net earnings of the residential class are too low, and that the industrial classes have not been exploited proportionally by the possible development of off-peak business. Dollars invested in the residential class are earning only one-third as much as those in the commercial class, but the flow of investment required is largely to the residential class. Further economic analysis shows that if the residential business is increasing in investment and gross revenue each year in a company without improving its net average return per dollar invested, unless increases take place in other lines of business, the net income of the company as a whole must vary inversely to the increase in residence business. The following example shows this in principle:

Assume a company with $50,000,000 investment with 40 per cent of the investment in the residential service:

$50,000,000 at 8 per cent net return	$4,000,000
20,000,000 at 4 per cent net return (residence business)	800,000
Balance of return to be earned...	$3,200,000

The remaining $30,000,000 must then earn 10.66 per cent.

Consider an increase in general business during the next year or two requiring 20 per cent increased investment, of which the residence business requires $7,500,000. The above becomes:

$60,000,000 at 8 per cent net return	$4,800,000
27,500,000 at 4 per cent net return (residence business)	1,100,000
Balance of return to be earned...	$3,700,000

Hence $32,500,000 must earn 11.48 per cent or the company's net income will be decreased.

This would not be a sound growth even if other commercial and industrial lines of business were increasing sufficiently to make up for the deficit of the residence class.

It can further be deduced by this cost analysis that while Company "B" may maintain itself in its present earning status under present business conditions, if a depression occurred, affecting earnings from its commercial lighting and small power class as well as its wholesale business, the company would have to rely on increasing numbers in its residential class. Difficulty would arise in such a period in obtaining the necessary growth to preserve its over-all net return of 8.25 per cent. The same unfortunate condition would be produced by a reduction in its residential or commercial lighting rates, which in this case are identical.

KNOWLEDGE OF COSTS AIDS IN RATE CASES

A reference has been made to the use of cost analysis in rate cases. It would be also useful in avoiding them, and a criticism of Company "B" might be drawn from this analysis. If it were possible for this company to increase the load factor of the residence class and consequently increase the rate of return from this class, as is the case in companies using the inducement rate, then this analysis shows that too high a burden is being placed on the commercial and industrial classes, that the residential class is not being intensively cultivated in a

manner to increase the earnings per dollar invested and also the proper proportion of industrial business is not being obtained.

In view of the known results obtained from inducement rates with an effective rate structure in a number of well-known companies, a company in the position described above, if attacked by certain classes of customers, might have a difficult task before a critical commision* to justify its almost constant rates bringing in high returns from stores and small power users on the ground of an enforced low return from the residence class, when no effective efforts have been made to improve the usage, revenue and rate of return from this class.

The accompanying chart shows by classes the analysis and trend of the growth of these two companies over a period of years, derived from known data as previously noted. In Company "A" the comparative proportion and stability of the course of investment is very clearly shown, and it is apparent that the balance of percentages of increased investment among the classes has been maintained steadily with remunerative returns. In Company "B" it is seen that the residential class earning the smaller return is absorbing increasing proportions of the investment and its other classes have been earning their larger returns on a decreasing percentage of the investment.

From figures at hand of kilowatt-hour usage per dollar of investment in these two companies, not given in this article, it also appears that in Company "A," although it earns 10 per cent net return from the community on each dollar invested by its owners, yet it furnishes 12 kw.-hr. per year for the earnings of that dollar, whereas Company "B," although it earns 8.25 per cent net on each invested dollar, furnishes only 6 kw.-hr. for these earnings. From the standpoint of the community as a whole, therefore, Company "A" is giving 65 per cent more service per dollar of net return than is given by Company "B."

From the respective annual revenues it is seen that Company "A" receives 33⅓ cents gross earnings per dollar invested, or an annual turnover of 1 to 3, whereas Company "B" receives only 23 cents gross per dollar invested, or a turnover of 1 to 4¼. It is obvious that the "investment efficiency"† of Company "A" from the stockholders' standpoint is nearly 50 per cent higher than that of Company "B."

From the foregoing presentation it will be seen that cost analysis has shown the main reasons why one of these companies, "A," is in a better and sounder position than the other, as defined by Mr. Insull in the quotation made earlier in this article.

Defective Electrical Installation and the Fire Danger

THE fire insurance company which has a monopoly of building insurance in Bavaria has, states *Elektrotechnik und Maschinenbau*, recently issued a report dealing with the subject of defective electrical installations and fire danger. A distinction is made in the report between cases in which fires were unquestionably due to the electrical installation and those in which this was merely suspected of being the cause. Of the fires in buildings which occurred in 1923-24 it is reported that 1.42 per cent were undoubtedly due to faults in the electrical installation, while 4.43 per cent were suspected cases.

In both categories by far the majority of the fires occurred in farm buildings, 88 per cent of the insurance money paid over being in relation to fires of this class. An inquiry into the prevalence of fires in electrically equipped farms showed that 23 per cent were due to non-protected motors and a similar percentage arose from conductors passing through roofs in which hay and straw were stored. Fires arising from faulty electrical installations are said to be increasing at the rate of 0.9 per cent per year, and the amount of indemnity paid in respect thereof has increased in the past few years from 1.01 per cent to 9.8 per cent. The report concludes with the remark that the matter is one that should receive the attention of electrical firms, which, on the one hand, should take greater care in making installations in farm buildings and, on the other, issue simple instructions to farmers regarding the precautions that must be taken to prevent fires.

Hydro-Electric Development in France Retarded

FRANCE has water-power resources which, under satisfactory conditions, are capable of producing the electrical energy necessary for economic advancement, according to a report quoted by the Division of Regional Information, Department of Commerce. Serious efforts have been made to utilize these valuable natural resources, but unfavorable conditions for some years have impeded such efforts, and recent statistics on electric development show a marked decrease as compared with expected results. Although construction begun during or subsequent to 1916 has been steadily continued and improvements have been made to the installations already in use, the carrying out of the greater part of new projects, for which plans were completed at the beginning of 1924, have been indefinitely postponed, the report declares.

The average amount of energy supplied by French hydro-electric plants during the period 1922 to 1924, inclusive, increased from 658,560 kw. to 1,263,260 kw., but the increase registered for 1925 was only about 50,000 kw. and even this greatly slackened rate may not be maintained in 1926. This stagnation, however, is said not to be due to decreased demand for additional energy, for consumption steadily increases. During the past year, it seems, there has been a tendency to meet this demand by the enlarging or erection of steam power plants rather than by the installation of hydro-electric plants. The result is that three-fourths of the electric energy furnished to consumers in France by the entire system of electric distributing stations is supplied by steam plants.

Lack of capital is given in the report as the chief cause of this condition. The government has made a careful survey of the electric power resources and has reached the conclusion that systematic construction and installation should be inaugurated and future development promoted. Special legislation and financial enactments are now pending which are intended to rectify the present situation by providing sources of revenue and foundations for loans.

*See Maryland Public Service Commission *re* Consolidated Gas, Electric Light & Power Company of Baltimore, Md., *Rate Research*, June 14, 1923, Vol. 23, p. 11.

†See A. K. Baylor's article, ELECTRICAL WORLD, March 20, 1926, p. 597.

Central Station and Industrial Practice

Fire Alarm Equipment Records Outages

BY F. F. BEAUCHAMP
Assistant Superintendent and Chief Engineer
Department of Water, Light and Power, Kansas City, Kan.

WHEN the city of Kansas City, Kan., did away with manually operated substations and installed automatic reclosing devices on each individual outgoing 2,200-volt feeder, a very serious problem presented itself when one or more of these feeders would trip out due to trouble. The trouble man had no way of knowing what feeder tripped out and the exact time when this feeder went out unless he waited for complaints to come in over the telephone from customers reporting that their lights were out. Oftentimes the only trouble "shooters" available were sent out to the location that the customer reported only to find upon arrival that there was no local trouble and the reason for the complaint was that the feeder had relayed due to overloading for some short circuit on the feeder. This often resulted in considerable delay in locating the actual trouble and sometimes it was hours before it was discovered.

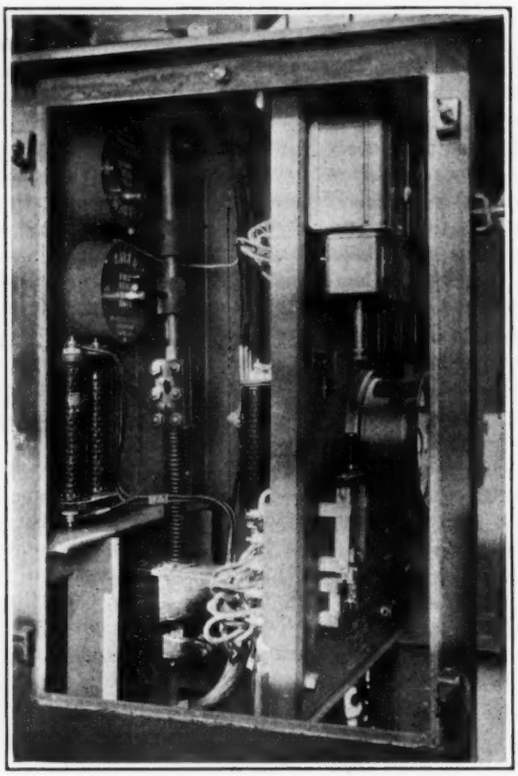


FIG. 2—APPLICATION OF CODE BOXES TO OUTDOOR TYPE OF OIL CIRCUIT BREAKER

The problem confronting us then was one of finding some inexpensive method or system that would notify the trouble clerk definitely which one of the feeders originating at one of the unattended substations was out.

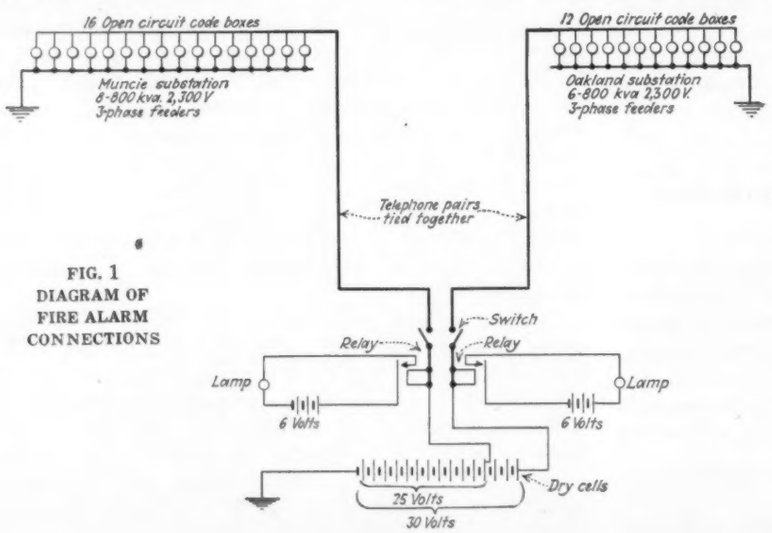


FIG. 1
DIAGRAM OF
FIRE ALARM
CONNECTIONS

The entire system was not quite large enough to justify installing one of the modern supervisory control systems, so it was decided to use some system that could be worked out using standard fire alarm equipment. The final system consisted simply of two open-circuit coded fire alarm boxes connected by mechanical means to each of 22 different oil switches so that when the oil switch functioned it would automatically code into the load dispatcher's office the number of the feeder that had tripped. Two code boxes were used in order to distinguish whether the switch went in or went out. In the case of feeder No. 22 when the feeder went out, No. 22 was coded on the punch register in the load dispatcher's office. When the feeder was closed, No. 222 was recorded on the punch register. The added 2 designated that the feeder had been closed. The type of punch register found on all fire alarm systems was used in connection with an automatic time stamp and take-up reel.

The circuits between the substations and the load dispatcher's office were rented pairs obtained from the local telephone company and were placed under ground for practically their entire length to minimize any outage caused by storms. The system at the present time is operating open circuit using shelf-type dry cells and will be changed at some future date to the closed circuit system using rectifiers and storage batteries.

At present no provision has been made to make the system non-interfering so that in the event of two feeders tripping out simultaneously a definite record of each outage will be made on the punch register. The possibility of two feeders relaying at the same time is rather remote, and no provision is made to prevent interfering.

Reporting Interruptions and Damage

IMMEDIATELY after any circuit or station interruptions have been cleared station operators of the Consumers Power Company of Michigan are required to prepare a

list of the interruptions, giving the following items in order: (1) Service interrupted; (2) time of interruption; (3) duration for length of interruption in minutes or hours and minutes; (4) cause of interruption, if it can be determined; (5) damaged apparatus, if any. As soon as convenient the operator then calls the load dispatcher, giving his station name, advising that he is reporting "interruptions" and reading the list so that the dispatcher can make a record of it. The interruptions are also recorded in the "Station Log Book" and on the "Station Log Sheet," which is sent in with the day's reports.

If any apparatus is damaged, a "Damaged Apparatus Report" is mailed to the division superintendent on the day the damage occurs or as soon thereafter as possible.

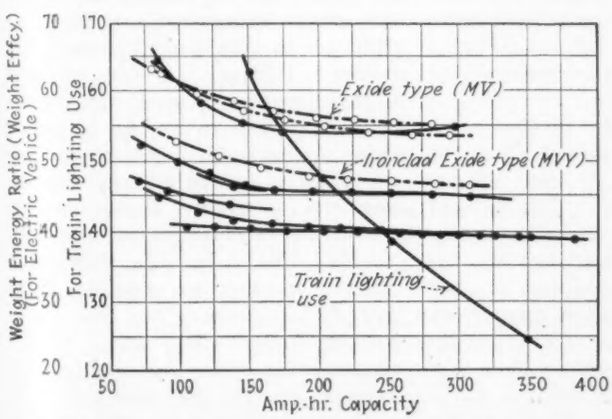
Weight Efficiency of Storage Batteries

BY SAKAE MAKIO
Electrotechnical Laboratory, Ministry of Communications, Tokyo

THE author of this article has made certain comparative investigations on various types and makes of storage batteries, the results of which are presented in the accompanying curves. As a standard of comparison between the various batteries tested a ratio of battery weights to kilowatt-hour output at a given discharge rate has been taken. This ratio of weight to energy output is advanced by the author for consideration as a standard reference in storage battery performance and quality.

The weight efficiency is defined as the ratio of kilogram weight, including electrolyte, to kilowatt-hours output at a particular discharge rate.

The vehicle battery standard was


Weight Energy Ratio (Weight Effcy.) (For Electric Vehicle)
For Train Lighting Use
Exide type (MV)
Ironclad Exide type (MVY)
Train lighting use
Amp.-hr. Capacity

WEIGHT-ENERGY RATIO CURVES OF STORAGE BATTERIES

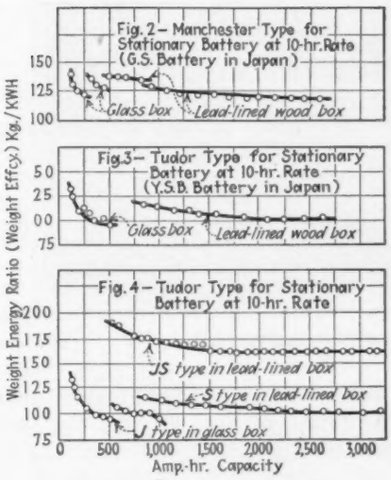


Fig. 2 – Manchester Type for Stationary Battery at 10-hr. Rate (G.S. Battery in Japan)
Glass box
Lead-lined wood box
Fig. 3 – Tudor Type for Stationary Battery at 10-hr. Rate (Y.S.B. Battery in Japan)
Glass box
Lead-lined wood box
Fig. 4 – Tudor Type for Stationary Battery at 10-hr. Rate
JS type in lead-lined box
S type in lead-lined box
J type in glass box
Weight Energy Ratio (Weight Effcy.) Kg./KWH
Amp.-hr. Capacity

STORAGE BATTERY WEIGHT-ENERGY CURVES

derived from laboratory tests on storage batteries supplied by two American manufacturers. In Fig. 1 weight efficiencies for the various capacities are plotted against the corresponding ampere-hours. In Fig. 2 are given the weight efficiency capacity curves obtained for various types of stationary batteries, which were supplied by Japanese, American, English and German manufacturers.

From the curves is derived the general conclusion that the mean weight-energy ratio for portable batteries may be taken as 50 at the normal five-hour discharge rate and as 100 for stationary batteries at a ten-hour discharge rate.

Construction of a Welded Crane Runway

ONE of the latest accomplishments in the application of the Stable-Arc welding process has been in the building of a crane runway without the use of rivets. Involved in the welding job there was approximately 65 tons of steel for the supporting frames and crane girders, which provide a runway of 245 ft. For the first time, so far as is known, welding replaced riveting on all of the shop-made connections. There were 1,800 ft. of continuous bead on the fourteen girders and 2,035 ft. in intermittent welds on the same steel members. On the supporting "A" frames there were 596 ft. of continuous bead and 403 ft. of intermittent beading.

The fourteen plate girders make a runway of seven bays, with a span of the crane supported by this runway of 100 ft., center to center of rails. The height of the twelve "A" frames supporting the girders is 21 ft. 11 in., whereas four others run to a greater height in order to make a roof over a portion of the runway. The load on the runway from each of the four wheels supporting the crane is 55,300 lb. plus 25 per cent thereof for impact.

A saving of 15 per cent of shop labor cost was effected in the expense that would have been involved had riveting been used. The time required for welding of the girders by the Stable-Arc process totaled 1,050 hours, and for the twelve supporting "A" frames 320 hours.

Fig. 2 shows the manner in which welds were made between the toe of

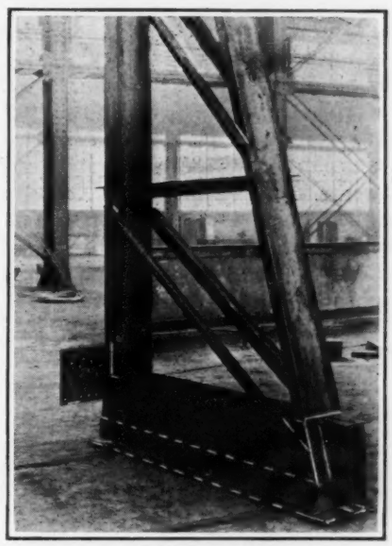


FIG. 1—FRAME ASSEMBLY

the angle and the webplate. This same illustration shows the method of attaching the 15-in. stiffener channel to the top flange angle, by the intermittent welds about 2½ in. long spaced about 8-in. centers.

As will be seen from Fig. 1, the entire "A" frame was built up by welding together the different steel members. Cross-pieces, plates and angles were all joined with the different types of beads, some of them being continuous and others intermittent, according to the special burden to be carried by any given portion of the frame.

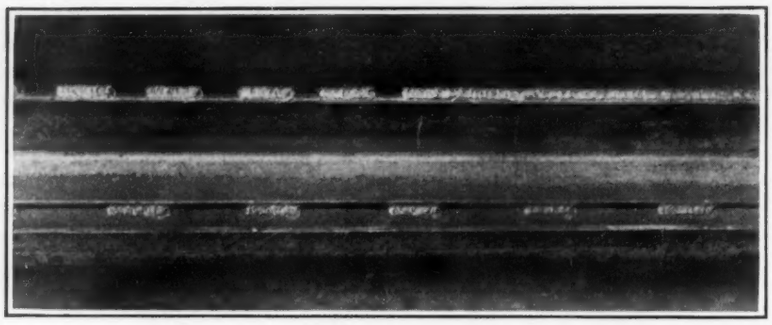


FIG. 2—CONTINUOUS AND INTERMITTENT BEADS

Of the total of sixteen frames such as that illustrated all but four were of the standard length for this job, 21 ft. 11 in., each having an approximate weight of 2,500 lb. The remaining four, identical save for the fact that they had extensions to carry a roof over one portion of the runway, each entirely electrically welded, weighed approximately 3,600 lb. apiece.

It is important to note that in addition to the 15 per cent saving effected on shop labor on this runway job through the use of the welding process in place of the older riveting method an additional saving was made possible in the quantity of material required. On the "A" frames it was possible to reduce somewhat the quantity of steel required from what would have been involved on a riveted job; this came about in the matter of detail gusset plates, which would have been necessary had the "A" frames been riveted. More important even than this phase of the job was the fact that through the use of welding it was possible to get uniformly good connections.

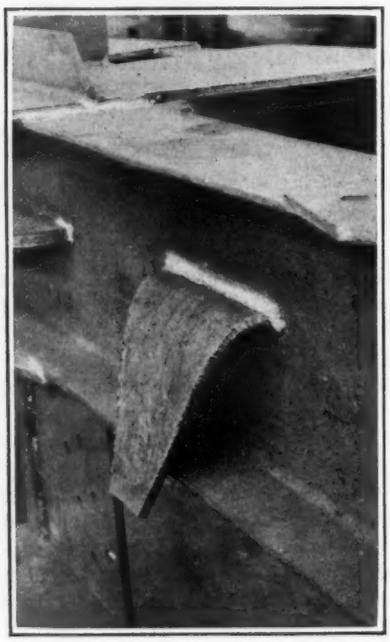


FIG. 3—TEST PIECE BENT OVER TO SHOW STRENGTH OF WELD

A test to which this type of welding was put is illustrated in Fig. 3. A plate 8x8⅝x9 in. was welded to the web of an I-beam, the 9-in. dimension being vertical. The plate was then bent by hitting it about 60 blows with a 10-lb. sledge. The result upon the plate is indicated by the bent position shown in the illustration. However, there was absolutely no evidence of a break in the weld.

Periodic Inspection Forestalls Troubles

BY O. M. WARD
Assistant Electrical Engineer Milwaukee Electric Railway & Light Company

TO OPERATE successfully, it is very essential that the operator keep ahead of trouble, and about the only way this can be done is to supplement the regular switchboard operator's inspections with systematic examinations by men trained in this particular line of work. Such inspection is of particular value in those cases in which the conditions that are compact of potentialities for trouble are not the results of any single action or phenomenon but are the effects of recurring actions, each perhaps minute in itself, but all being cumulative and finally manifesting themselves in trouble.

To make certain that no equipment is overlooked, a list is kept of all the electrical equipment in each substation and power plant. The date of the last inspection is entered for each piece of equipment, so that the supervisor or chief operator can tell in a few moments when inspections are due and schedule the work accordingly. If unusual trouble or indications of trouble are found, a distinguishing mark, in addition to the date of the last inspection, is entered on the same sheet calling attention to this fact, and the inspection report is referred to when the next inspection is made. In this way faulty design or construction is discovered and eliminated before it develops into serious trouble.

The interval between inspections is based upon the importance of the apparatus, probability of trouble as indicated by past experience, and the cost of making the inspection. Inspections of oil circuit breakers are made on the average about once every six months. However, main generator oil circuit breakers are examined weekly to see that the mechanism and external current-carrying parts are in first-class condition. On the other hand, some oil circuit breakers and other equipment that are located at remote stations where the service is not severe and of relatively small importance are overhauled but once a year. This is particularly true if it is necessary to interrupt service to make the inspections. Emergency inspections are also made as soon as possible after an oil circuit breaker has opened an overload. Some of the more important motors are thoroughly inspected and tested once a month. Others of lesser importance are inspected and tested about twice a year. All checks include examination and insulation tests of the motor leads and starting equipment. Main generators are inspected and tested approximately twice a year unless the insulation tests indicate unusual conditions, in which case the tests are more frequent, sometimes as often as once a week. Main busbars are inspected every six months. With the exception of the buses, practically all inspections are independent of cleaning schedules.

The electrical equipment is considered as being divided into four groups: (1) Oil circuit breakers; (2) main generators, motor generators and rotary converters; (3) motors; (4) buses. A form for each of these groups is used and the information filled in by the inspector when he checks the equipment.

The effectiveness of periodic inspections is clearly shown by the record of service delays due to station trouble. To keep the inspection expense as low as possible, however, it is necessary for the supervisor to keep a close watch of the maintenance costs and change the schedules so that they best take care of the particular needs of each station. Our records show a decided

decrease in outages due to station trouble and in maintenance costs for four years following the starting of periodic inspection, and in general conditions have continued to improve up to the present time.

Restoring Substation Service After Transmission Interruption

OPERATORS of substations owned by the Consumers Power Company of Michigan follow a definite procedure in restoring service after a transmission-line interruption, just as they do in assisting the prevention or isolation of a pending interruption.

Keeping always on the alert for telephone calls from the load dispatcher so there will be no delay in answering him, the operators first place the alternating-current switches of one rotary-converter or motor-generator set in the starting position, if it was running before the interruption. Then they watch for restoration of transmission service indicated by the hum of transformers, movement of voltmeter pointers to approximate normal position, lighting of substation lamps and starting of the machine the switches of which were placed in the starting position or by the arc obtained in trying to charge the lightning arresters.

Meanwhile the operators make a close inspection of all apparatus, looking at high-voltage insulators, roof, wall and oil-switch bushings for cracks, and evidence of puncture or breakage. Wires and other conductors are observed for possible breaks, burned parts, melting at lugs or similar faults. Evidence is noted of trouble inside of oil switches, transformers and regulators such as smoke, leaking oil, bulged tanks or smell of burning insulation. In looking over the machines special attention is paid to brushes, commutators, brush shunts (or "pig tails") and slip rings. An eye is kept open for any broken wedges around or under machines and bond wires which are loose or broken. The alarm bells, telephone fuses and equipment are inspected, and to make sure that the instrument is working, the operators usually "listen in." The potential transformers, meters and the corresponding fuses are also observed for defects.

As soon as power is received the machine or machines that were running before the trouble are started in the usual manner. The incoming switches on the low-tension side of the transformers and the distribution circuit switches (if they were opened) are closed according to a schedule posted in the station. Street-lighting equipment is restored to operation as quickly as possible if it was in operation previously. If the regulator motor switch was opened, it is closed and the regulator observed to make sure it resumes its function properly.

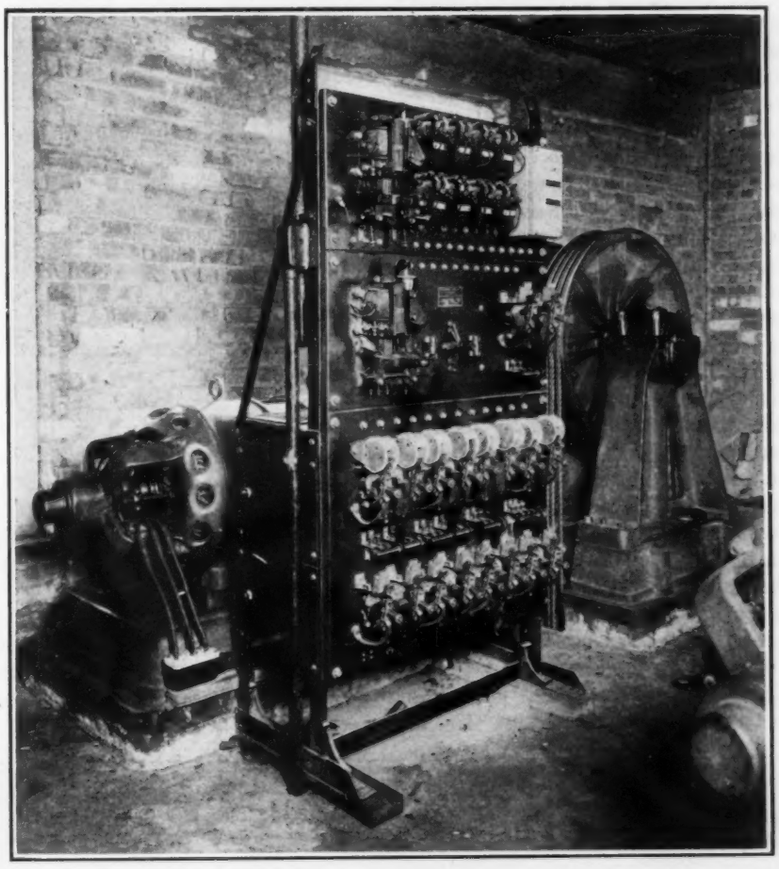
If power was restored so quickly that time was not allowed for the station inspection mentioned, the inspection is made after service is restored.

To avoid delaying the restoration of service, station operators of this company are required to keep away from the telephone during the first ten minutes after trouble begins unless called or important information is to be imparted. At the end of ten minutes, if power is not yet received, operators must make every effort to get in communication with the load dispatcher, using private or long-distance telephone or telegraph.

Developments in Elevator Control

BY N. L. MORTENSEN
Assistant Chief Engineer
Cutler-Hammer Manufacturing Company,
Milwaukee, Wis.

LATE advances in the elevator field have consisted primarily of extensive use of push-button control. There has been a decided increase in what is termed the "hold-down" push-button type for elevator controllers, principally for freight service. The passenger or operator holds down the call button until the car arrives at his floor, and after he enters the car, the elevator is operated from another set of buttons or by an ordinary car-operating switch. The advantages of this system are low cost and simplicity. There have also been control equipments and installations made where the passenger calls his floor as he enters the car. The operator presses a corresponding button and the car automatically stops at each floor selected.



TWO-SPEED, ALTERNATING-CURRENT, DUAL CONTROL, ELEVATOR CONTROLLER IN BROADMORE HOTEL, CHICAGO

The variable voltage control system has come prominently into use on medium-speed and high-speed elevators. The multi-speed motor is also used to a considerable extent.

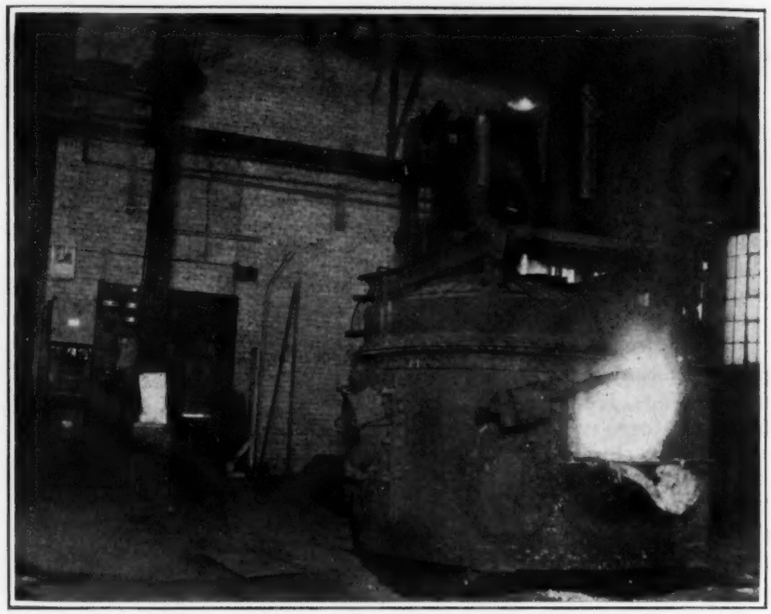
Commercial Activities and Public Relations

Chicago Foundry Increases Electric Heat Applications

BY J. H. FAULKNER
Industrial Engineer Commonwealth Edison Company

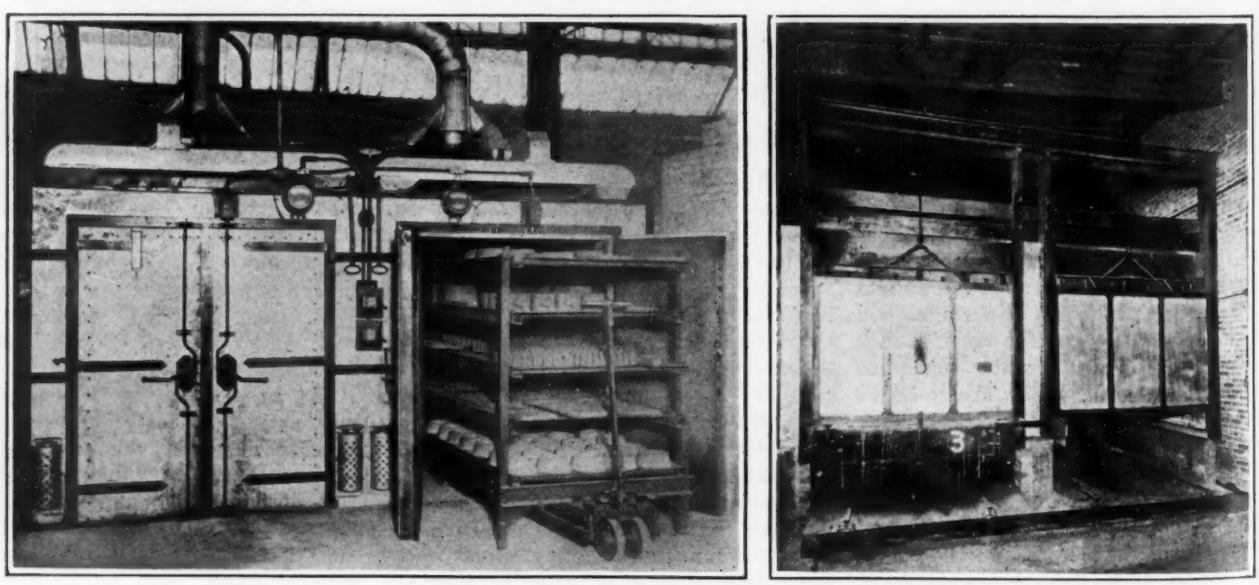
ONE of Chicago's oldest and largest jobbing steel foundries, the Chicago Steel Foundry, has completely electrified its entire foundry by adding to the present electrical equipment an electric furnace for annealing steel castings, and an electric oven for baking cores.

The first installation of electric heat by this company was a 3½-ton electric melting furnace for melting steel scrap. The fact that this furnace has been in operation continually since the time of installation is an indication that it is successful. A feature of its design is the removable roof, which permits the furnace to be charged by the overhead crane instead of by hand. This furnace is capable of melting from cold 3½ tons of steel scrap in one and a half hours. The principal saving is due to the ability to charge cheap scrap instead of pig iron and obtain a better metal than by any other practice. Absolute control over the atmosphere of the furnace makes this better metal possible, it is claimed.



A 3½-TON STEEL-MELTING FURNACE

The demand for electric-melted steel became greater due to its higher quality, and later it was found that electric-annealed steel possessed the same superior qualities over steel annealed by other methods. This firm, to be progressive, then ordered and installed an electric annealing furnace. One feature of this design (which is the car-bottom type) is the location of the heating and cooling chambers side by side. These two chambers are used in such a way that the heating chamber is never cooled down. A cold charge enters this chamber by means of transfer cars on tracks and is brought up to the annealing temperature and "soaked" for a certain time. After this time has elapsed the charge is transferred to the cooling chamber and allowed to cool slowly. This chamber is made of the same design and material as the heating element. The economy of this design is that the heating furnace is



AT LEFT—120-KW. TWO-COMPARTMENT CORE-BAKING OVEN. AT RIGHT—STEEL CASTINGS ARE ANNEALED IN THIS 300-KW. ELECTRIC FURNACE

never allowed to cool, keeping a reservoir of heat stored all of the time. At present fuel prices the complete cost is lower with electricity.

The latest addition to the heating load of this plant is a large core-baking oven. As in the case of the steel-annealing furnace, this is a place where a close, exacting temperature control is needed. In the past rejects in castings have been largely due to bad cores, and most of the bad cores could be laid to poor baking. Consequently this firm installed the latest type of oven. The oven consists of two compartments each equipped with double doors and large enough for the loading racks to be placed inside. These racks are loaded in the core-making room and hauled by means of a lifting truck to the oven. Several racks and one truck make the installation very flexible. The heating units, which are 60 kw. for each compartment, are located in grids around the side wall near the bottom. The air intakes are located in front, and any cold air coming in passes through the heating units. Circulation is provided by a fan on top of the oven.

The price of fuel, although an important question in all of the operations, was not the sole factor considered. This firm desires first of all to give a better product. It might be stated that the over-all cost of doing it electrically is less than that of any other method, according to David Evans, president of the Chicago Steel Foundry Company. Energy is supplied by the Commonwealth Edison Company.

Sign Surveys and Contractor Co-operation

AN ELECTRIC-SIGN service that will involve providing the maintenance and energy and possibly the original sign is recognized as having desirable features, but at present the Minneapolis General Electric Company depends on sign surveys and co-operation with contractors. Periodically a utility representative makes a survey at night of all electric signs, noting particularly whether any lamps are extinguished or dull. The owner is then sent a personal letter indicating how the outages or dull lamps detract from his sign and its business appeal. Contractors are also advised of such conditions and the possibility of their offering a relamping and general sign maintenance service to the sign owners.

Comparing Costs of Generated and Purchased Power

THE Western Tablet & Stationery Company of St. Joseph, Mo., has purchased power at 2,300 volts from the St. Joseph Railway, Light, Heat & Power Company for some time. Its plant had consisted of two buildings but it recently purchased an adjoining building, the owners of which had failed. This building had not used central-station service, being served by two uniflow engines connected to direct-current generators. In making plans for occupying the third building the stationery company naturally considered using the engines already installed to furnish power for the entire plant and called in outside engineers to analyze the situation. This report advocated using the engines, but the stationery company was not satisfied with this decision and checked all comparative costs with the power company.

After careful consideration it was decided to use central-station service for all three buildings and use the boiler plant for steam heating only. The reasons for this action were as follows, based on an analysis made by J. B. Barfield, electrical superintendent of the power company:

1. The direct-current generators and switchboards could not be used, and replacing them would involve an investment of $9,553.00.

2. The accompanying tables give the comparative costs by months for generated and purchased power.

3. If purchased power were used, a new transformer bank would have to be installed at a cost of $1,620. The outside engineers did not include this cost, but if good service were to be maintained in the plant these transformers or heavier copper at a greater cost would have had to be installed regardless of whether power was purchased or generated.

4. In estimating the kilowatt-hours to be generated the outside engineers had figured it at 220 volts. If the transformers were installed to give good service, the total cost in Table II would be increased $243 + $48.60 = $291.60 on transformers and $93 for extra fuel cost.

5. The cost of steam at low pressure for heating only is less than at high pressure for operating the engines and exhaust heating. Temperature of low-pressure steam is 228 deg. F. and of high-pressure steam is 336 deg. F., a difference of 138 deg. F.

For each 25 deg. rise in flue gas temperature the boiler efficiency drops 1 per cent; hence the boiler efficiency is 5.5 per cent lower at the higher pressure. The heat taken out of the steam when the pressure is lowered through the engines is approximately 4 per cent on a strict British thermal unit basis, but the National District Heating Association report puts this loss at from 15 to 25 per cent and the actual water rate of reciprocating engines (on heat) at 50 lb. per kilowatt-hour, though the guarantee called for 30 lb. per kilowatt-hour. Should these items be estimated according to the National District Heating Association report, the fuel cost in Table II would be increased $650.

6. The electric load comes at a definite time each day, probably from 8 a.m. to 5 p.m., whereas the heating load depends on the weather.

TABLE I—COST OF PURCHASED POWER AND STEAM HEATING

	Kw.-Hr. Purchased	Lb. Steam Required for Heating 5 Lb. Pres.	Fuel Cost, 30 Cents per 1,000 Lb.	Labor Cost per Month	Maintenance, 5.5% on $15,923	Taxes and Insurance 3%	Cost of Current Purchased	15% on Transformers $1,620	Depreciation, 5% on $15,923	Maint., Trans., 3% on $1,620	Cost of Water	Total Cost per Year
January	33,625	6,840	$2,052.00	$725	$73	$40	$889.45	$20.25	$66.35	$4.05	$94.60	$3,964.70
February	33,296	5,420	1,626.00	725	73	40	888.30	20.25	66.35	4.05	80.40	3,523.35
March	29,045	3,420	1,026.00	725	73	40	800.20	20.25	66.35	4.05	58.95	2,813.80
April	40,939	1,425	427.50	725	73	40	1,037.40	20.25	66.35	4.05	29.45	2,423.00
May	31,700	855	256.50	725	73	40	847.25	20.25	66.35	4.05	19.65	2,052.05
June	30,197	.....	.....	.....	....	40	848.15	20.25	66.35	4.05	.....	978.80
July	31,575	.....	.....	.....	....	40	854.20	20.25	66.35	4.05	.....	984.85
August	34,133	.....	.....	.....	....	40	885.20	20.25	66.35	4.05	.....	1,015.85
September	36,361	.....	.....	.....	....	40	938.85	20.25	66.35	4.05	.....	1,069.50
October	27,265	1,710	513.00	725	73	40	750.65	20.25	66.35	4.05	34.15	2,226.45
November	29,015	2,850	855.00	725	73	40	791.05	20.25	66.35	4.05	52.00	2,626.70
December	22,991	5,980	1,694.00	725	73	40	643.30	20.25	66.35	4.05	86.00	3,351.95
Total	380,142	28,500,000	$8,450.00	$5,800	$584	$480	$10,174.00	$243.00	$796.20	$48.60	$455.20	$27,031.00

TABLE II—COST OF GENERATED POWER AND STEAM HEATING

	Kw.-Hr. Generated	1,000 Lb. Steam Required for Electric and Heat 150 Lb. Pres.	Fuel Cost	Labor Cost Per Mo.	Lub. Oil Miscl. Oper. Cost	Generators Interest, 6% on $9,553	Maintenance, 5.5% on $15,923 3% on $9,553 5.5% on $15,000	Depreciation, 5% on $15,923 5% on $9,553 5% on $15,000	Taxes and Insurance 3% on $15,923 3% on $9,553 3% on $15,000	Cost of Water	Total Cost per Year
January	31,904	6,840	$2,324	$725	$15	$47.80	$166.65	$168.65	$101.20	$94.60	$3,642.90
February	31,579	5,420	1,840	725	15	47.80	166.65	168.65	101.20	80.40	3,144.70
March	27,380	3,420	1,162	725	15	47.80	166.65	168.65	101.20	58.95	2,445.25
April	39,129	2,050	697	725	15	47.80	166.65	168.65	101.20	40.20	1,961.50
May	30,003	1,575	536	725	15	47.80	166.65	168.65	101.20	32.00	1,792.30
June	28,518	913	312	725	15	47.80	166.65	168.65	101.20	20.65	1,556.95
July	29,879	959	326	725	15	47.80	166.65	168.65	101.20	21.45	1,571.75
August	32,406	1,040	353	725	15	47.80	166.65	168.65	101.20	22.85	1,600.15
September	34,606	1,110	377	725	15	47.80	166.65	168.65	101.20	23.85	1,625.15
October	25,622	2,120	722	725	15	47.80	166.65	168.65	101.20	41.40	1,987.70
November	27,351	2,850	970	725	15	47.80	166.65	168.65	101.20	52.00	2,246.30
December	21,400	5,980	2,032	725	15	47.80	166.65	168.65	101.20	86.00	3,342.30
Total	359,777	34,277,000	$11,651	$8,700	$180	$573.20	$2,000.00	$2,023.80	$1,214.40	$574.35	$26,916.96

The peak of the heating load is from 6 to 8 a.m., before the real power load starts. In the spring and fall there are quite a few days when no heat is required, some when heat is required all day, and a large portion during which heat is required only from 6 until 10 a.m. There are only three months (December, January and February) in which no extra steam above that required for heating will be required for generation, but this was not considered in making up Table II.

The tables show the total cost of purchased power as $27,031 per year and the cost of generated power as $26,916.95 per year. If the additions enumerated above are added, the total cost of generated power is $27,951.55. The stationery company, after considering these comparative figures, the extra investment necessary to utilize the engines and the troubles possible if it operated its own plant, decided to scrap the engines and use central-station service.

Utility's Records Best for Domestic Credit Standing

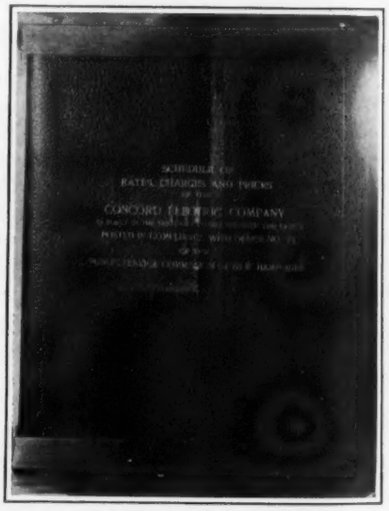
IF A domestic customer wishes to purchase anything on the time-payment plan, nothing is quite the equal of an electric-service company's own records for establishing his credit, declares J. W. DeMain, credit manager of the Northern States Power Company. This company maintains only what it calls a "negative credit record" based on service cutouts, returned checks and reverted merchandise. Although delinquencies in paying bills are not indicated in this "negative credit record," they can be ascertained readily, but bills are easily overlooked, especially around vacation time, hence much importance is not placed on occasional delinquency. However, cutouts are significant, as they result only after three notices have been mailed and a tactful collector has called to arrange for back payments on installments if necessary.

Ownership of property, bank, store and employer references are also the basis for establishing domestic credit, although judgment of character from contact with the customer is relied upon sometimes where a more substantial basis for credit is not made available.

Novel Electric Signboard

AN ELECTRICALLY operated, animated billboard has been placed in operation on a much-traveled thoroughfare in Salt Lake City by the Rocky Mountain Electrical Co-operative League in an endeavor to promote the "better homes" idea as related to a greater use of electricity in the home. The board is of the vista or stage type, 10x30 ft., using three sets of color lights, representing daylight, sunset and moonlight. As the sunset changes to moonlight the interior of the house appears to become lighted up, all of the windows presenting a striking example of a well-lighted home from outside.

Rate Book Holder Aids Public Scrutiny of Utility Tariffs



RATE BOOK IN BRASS RACK PIECES SCREWED TO BUILDING COLUMN

TO FACILITATE popular examination of current rate schedules in its office, the Concord (N. H.) Electric Company recently designed a simple but attractive holder, as illustrated herewith, which enables the loose-leaf schedule book of the company to be carried on the side of a column just above the counter and accessible to all comers. All rates are recorded in a letter-size book with attractive binding, which fits into two brass rack pieces. The rack cost less than $5, and the quick availability of the schedules has an excellent influence upon public relations. J. M. Ahern is office manager.

Digest of Electrical Literature

Hydro-Electric Developments and Steam Equipment

Electrical Development in British Columbia. — H. VICKERS. — This, the third of a series of papers on "Power Throughout the British Empire," gives statistics regarding the use of electricity in the Pacific Coast province. In the West as in the extreme East of Canada the pulp and paper industry is an important consumer of electric power. The total possible hydro-electric power capable of development in British Columbia has been estimated at 2,500,000 hp., while the total installation consists of about 305,315 hp. Of this 207,656 hp. is developed for sale by hydro-electric stations, 48,800 hp. is developed by pulp and paper mills and 48,850 hp. by mining and other industries. Incidentally there is in the paper a considerable amount of information on the use of electricity in the lumber industry and in mining.—*World Power*, June, 1926.

Generation, Control, Switching and Protection

Practical Calculation of Short-Circuit Stresses in Supports for Straight, Parallel-Bar Conductors.—O. R. SCHURIG, C. W. FRICK and M. F. THAYER.—The method of stress calculation here described takes into account the following factors: The short-circuit current, its decrement rate, the electromagnetic force due to the current, the natural frequencies of the busbar structures, and their motional resistance. Formulas are given for several common arrangements of conductors for both lateral and longitudinal stress calculations, expressed in terms of the initial value of the short-circuit, the mechanical dimensions and spacing of the bars, the natural frequencies of the busbar structure and frequency of the current. The formulas are supplemented by charts, tables of natural frequencies for different busbar structures and illustrative computations. Suggestions for keeping the maximum support stresses low include, among others, selection of values of natural frequencies for which the stress factors are low, avoidance of structures in which busbar taps or cables are loose, so as to guard against hammer blows, and provision for uniform current division among the laminations of each phase in adjacent polyphase buses.—*General Electric Review*, August, 1926.

Step Oil Switches.—A. MAUDUIT.—When oil switches are called upon to connect unloaded transformers or underground cables to a source of electric supply, a very considerable rush of current may occur, which in turn can be the cause of dangerous overvoltages. A remedy for this is afforded by providing in the oil switch auxiliary contacts which are connected over an ohmic resistance to the main contacts. The closing member of the switch closes first upon the auxiliary and a moment later upon the main contacts. A properly dimensioned resistance will act in this case as a buffer against current rushes. An example of such a switch is given in the paper, showing an American circuit breaker in which a resistance wire has been wound around the explosion chamber. A number of oscillograms are reproduced, indicating the beneficial influence of step switches as compared with ordinary direct-closing breakers.—*Revue Générale de l'Electricité*, June 12, 1926.

Transmission, Substations and Distribution

Remote-Controlled Mercury-Arc Rectifier Stations.—W. WEISSBACH.—Outlying substations for changing three-phase into direct current can be arranged very simply, reliably and inexpensively if mercury-arc rectifiers are installed and the substation is connected over a suitable number of pilot wires to the mother plant. For currents of less than 1,000 amp. the glass-vessel type of rectifier is recommended, while the steel type is more suitable for larger currents. Provisions are usually made to accomplish the following actions: (1) Starting and stopping of station, (2) regulation of direct current, (3) distant reading of potential and current, (4) signaling of disturbances. Depending upon the number of units in the station, from four to eleven small pilot wires are required. Diagrams for such stations are given for a number of characteristic installations. Considerable saving in pilot wires results if it is possible to confine simultaneous reading of several values to a minimum. The number of such substations in Germany is increasing very rapidly. In 1923 their total rating was only 20,000 kw., while at the end of 1925 over 90,000 kw. in large remotely controlled rectifier plants was installed and in satisfactory operation. — *Siemens Zeitschrift*, June, 1926.

Quality Rating of High-Tension Cable with Impregnated Paper Insulation.—G. W. ROPER and HERMAN HALPERIN.—During the past five or six years virtually all of the American cable manufacturers have made some changes in their impregnating compounds to produce cable having a low dielectric loss. In a number of cases these compounds were not well chosen. During the same period some of the operating companies have reduced the thickness of their insulation, resulting in increased dielectric stresses. In a number of cases the compounds, and also the paper that was used, developed faults that were more serious than high dielectric loss. Some cables have been very deficient in dielectric strength, and others have developed a new type of trouble which has been termed "ionization." After a comparatively short time the operating voltage of such cable had to be materially reduced or the cable replaced in order to keep the lines in service. The cable manufactured during this period has generally passed, with a wide margin, the high-voltage tests required by the specifications. Occasionally a lot of cable which passes such tests by a narrow margin will be shipped by a manufacturer, and in such cases the service record of the cable is bound to be unsatisfactory. The investigations which form the basis of this paper consisted of laboratory tests to determine what high-voltage tests cable commonly known to be of good quality will withstand, as well as similar tests on other grades of cable; likewise, a careful examination and dissection of samples of the cable as received from the factory and samples removed from lines failing in service after having been operated for a number of years without failure. A comparison of the operating records of the cable with the results of the dissection and examination of the samples and with the factory inspection and tests made on the cable before shipment is included. Accelerated life tests on long samples of cable having a wide range in quality were made. The results of these investigations were correlated in a manner which permitted of the determination of the relative quality of several lots of cable purchased, as well as of changes in the specifications which must be made in order to obtain satisfactory high-tension cable with impregnated paper insulation.—*A.I.E.E. Journal*, June, 1926.

Heat Applications and Material Handling

Household Heating Appliances.—J. WOLF.—A résumé is given of the present status of construction and use of heating appliances in Germany. During the war period other countries made great strides in both the design and the popularization of heating apparatus for household use. The writer claims that Germany has now fully caught up with foreign countries in that respect. Detailed accounts are given regarding the four main classes of these appliances, cookers, water heaters, hygienic apparatus and room heaters. Great attention has been paid to four chief selling points—long life, high efficiency, regulation and low cost. One of the greatest improvements is the recent perfection of fully dependable thermostats, which are able to control safely very large energies and are in themselves very small. High-capacity flatirons equipped with such regulators show a decided economy over unregulated irons. Examples are given of bimetallic direct-acting thermostats and of thermostats which actuate a mercury-break contact. Water heaters, fireless cookers and various oven constructions are described and illustrated. Finally room heaters, which operate on the heat-accumulating principle, are mentioned. The article has 23 illustrations. — *Elektrotechnische Zeitschrift*, June 24, 1926.

Progress in Electrochemistry and Electrometallurgy.—G. W. VINAL.—In the annual report of the committee on electrochemistry and electrometallurgy presented at the convention of the A.I.E.E. at White Sulphur Springs, W. Va., June 21-25, the desirability was pointed out of making the inter-

national electrical units conform more accurately to the theoretical values corresponding to the absolute c.g.s. units. Among the items of progress rehearsed are the following: Chromium deposition, valuable for the extraordinarily hard surface it gives to plates for engravings and its resistance to tarnish on reflectors; improved control of electric furnaces for the production of steel and ferro-alloys; experiments with high-frequency induction furnaces for brass, whereby it was found that instead of 12,000 cycles, frequencies as low as 480 cycles could be used, with the advantage that this latter frequency was obtainable with the aid of a frequency-changer set, the requisite power-factor correction being secured by the use of static condensers. The report further discusses the conditions which determine the choice between operating isolated plants and purchasing electrical energy in electrochemical establishments.—*Journal A.I.E.E.*, August, 1926.

Units, Measurements and Instruments

High-Voltage Laboratories.—A. P. M. FLEMING.—To allow a suitable margin over working voltages and to keep ahead of future developments calls for research laboratories providing facilities for not less than 1,000,000 volts. At the present time there are several such installations on the Continent of Europe and in America. Two are under construction or in contemplation in Great Britain and one in Russia. The article describes the layout in a number of these laboratories, with particular reference to the transformer connections. In general, the high voltage is obtained either by the use of two transformers in series with an insulating transformer to separate the second unit from the supply line or by a cascade arrangement. Several of these arrangements are shown schematically, in particular those at Pittsfield, Pasadena, Ivry and Freiburg. The author next takes up the matter of power supply, regulation, and measurement of high voltage, pointing out the limitations of the various methods at present in use, which include the transformer ratio, the use of a voltmeter coil, the sphere gap, crest voltmeter, electrostatic voltmeter and attracted disk electrometer. For the measurement of dielectric loss the trend in the past few years has been growing in the direction of bridge rather than wattmeter methods. A form which has been used with marked success is due to Schering. Its operation is described in detail in the article.—*World Power*, July, 1926.

Illumination

Research in Illumination.—JOHN W. T. WALSH.—After pointing out that a study of the properties of the eye is of at least equal importance with the studies of properties of illuminants and after calling attention to the necessity for fundamental research as well as investigation of immediate practical problems, the author outlines the work of the illumination research committee of the British Illuminating Engineering Society. The first fundamental problem is a thorough study of glare, which is being carried on in co-operation with various other bodies. The second is that of the relation between the degree of illumination and the ease and accuracy of performing fine work. In England a recent study of the printing industry has led to the general conclusion that increased illumination is beneficial up to about 20 foot-candles. Detailed information on this particular study is to be available soon. Reference is also made to other studies both in England and in America. A third fundamental investigation is that on the effect of fenestration on the natural lighting of rooms. In the meantime several special problems have required more or less immediate attention, such as (a) the design of industrial enameled iron reflectors, (b) the design of picture galleries to give adequate illumination with a minimum of reflection, (c) the effect of color and distribution on the degree of illumination required for comfortable work, (d) the effect of a flickering illumination on ease of working, (e) the brightness of diffusing glassware, (f) the temperature of illumination fittings under normal conditions of operation. In some instances reports have been published giving the results of these studies and citations are made from such reports.—*Illuminating Engineer (British)*, July, 1926.

Traction

Transmission of Power on Oil-Engine Locomotives.—A. I. LIPETZ.—Power transmission on oil-engine locomotives depends upon the type of the oil engine for the locomotive and upon the conditions under which the locomotive is going to run. The present paper pertains to transmission of power only and gives a classification of power transmissions in the chronological order of their appearance. Class A comprises torque-power elastic-fluid transmissions in which the total output of the oil engine is transferred into elastic-fluid energy, which is in turn utilized for the propulsion of the locomotive. The efficiency of such a transmission is the product of the two separate efficiencies of the generation and utilization of energy. Various types of electric, hydraulic, pneumatic, compressed-steam, aero-steam and compressed-exhaust-gas transmissions are described. Class B consists of differential elastic-fluid transmissions in which the power from the oil engine is transferred directly to the driving wheel at top speeds of the locomotive with a very high efficiency, and partly directly and partly indirectly at all intermediate speeds. The theory of such transmissions is expounded and formulas for torques, speeds and efficiencies are derived. Class C pertains to mechanical and direct transmission. The drawing of conclusions as to the possible fields of application of various types of transmission is postponed until the questions of the types of oil engines and different conditions of locomotive performance on railroads shall be discussed in a separate paper.—*Journal of Mechanical Engineering*, August, 1926.

Motors and Control

New Type of Controller.—G. GUT.—When direct-current motors for 1,000 volts or more are operated with the usual type of controller, difficulties are encountered because the arcs formed between revolving segments and stationary fingers become unmanageable. A Swiss concern is now building a new type of controller for direct-current voltages up to 1,500, where, instead of segments, a number of disk cams are keyed to the main shaft of the controller and these cams actuate as many contactors with individual magnetic blowouts. The performance of these controllers is held to be very satisfactory, with exceptionally small wear. In spite of this radically different design, the new controller is not much larger than the old segment type. For 1,500 volts, however, the device becomes somewhat too large to be placed in front of the motorman, in which case mechanically remote operation is resorted to, with the controller installed usually under the car. Three controller connections for 1,000 volts are shown, using two and four motors.—*Brown, Boveri Mitteilungen*, July, 1926.

Miscellaneous

Rural Electrification.—G. C. NEFF.—The paper points out the effect of power and machinery on the living conditions of the American farm and the part electricity may play. It discusses the things being done by the agricultural and electrical industries to direct and bring about a proper development of this service. The schedule of rates for farm customers of one of the large utility companies of Wisconsin and an analysis of the kilowatt-hours used by 1,226 farmers served by one company are shown in the accompanying tables.—*Journal A.I.E.E.*, August, 1926.

RATES FOR FARM CUSTOMERS

(a) Service Charge

Transformer Capacity Required (in Kva.)

	Monthly Service Charge
Not more than 1½	$5.50
Over 1½ and not more than 3	6.00
Over 3 and not more than 5	6.60
Over 5 and not more than 7½	6.25
Over 7½ and not more than 10	8.00

If more than two rural customers are served from one transformer, each of them will be allowed a discount on his service charge as follows:

Customers Served	Discount on Service Charge, per Cent
3	20
4	40
5	50

(b) Energy Charge

	Cents per Kw.-Hr.
First 30 kw.-hr. used per month	5½
Excess over 30 kw.-hr. used per month	3½

CLASSIFICATION OF CUSTOMERS BY AVERAGE MONTHLY USE OF ENERGY

Kw.-hr. Consumed per Month	Number of Customers	Per Cent of Total Number
Less than 10	123	10
10-19	390	32
20-29	275	22
30-39	158	13
40-49	75	6
50-100	131	11
Over 100	74	6
Total	1,226	100

News of the Industry

Hartford Electric Light Will Pay Customer Dividend

The directors of the Hartford Electric Light Company have authorized another customer dividend to be paid in October this year. The dividend will be in the form of a rebate of 60 per cent on the amount of October bills and will total over $250,000. A year ago in October a 50 per cent customer dividend was returned to customers and amounted to $225,000. A payment of $6.25 as a premium charge on an issue of 10,000 shares in 1920 will be returned to stockholders.

O. D. Young Talks on St. Lawrence Development

Interviewed by the press after a conference with President Coolidge, Owen D. Young expressed the opinion that the negotiations between the State of New York and the Province of Ontario over St. Lawrence River power questions constituted a great advance toward the development of this stream. Mr. Young, while still inclined to view favorably Governor Smith's plan by which hydro-electricity would be generated by a public corporation, reiterated his belief that the distribution and selling of the power should be done by a private corporation. The latter, he said, could sell power more economically and efficiently than a public corporation.

"The chief cost of water-power development is the cost of money," Mr. Young said. "Therefore if a public corporation built the dam and sold its bonds, it could get the money cheaper than a private corporation. The dam should be built by the Water Power Authority and the power for transmission sold to private corporations."

Asked whether power could be sold as cheaply in New York as in Ontario, Mr. Young said it could if allowance were made for the taxes which private corporations paid to the government. It had not been determined yet that St. Lawrence power could be sent economically to New York City, but once the river was developed New York would get the benefit of it, as well as other parts of the state.

Deny Political Delay on St. Lawrence Applications

Senator John A. Knight, leader of the Republican majority in the New York State Senate, who is a member of the State Water Power Commission, denied this week that the action of the commission relative to granting a license for the development of the St. Lawrence River power is being delayed for political reasons and declared that the commission is functioning as rapidly as possible in accordance with the provisions of law and that a meeting will be called within the next ten days or two weeks to pass upon details. Senator Knight said in part:

"The State Engineer and Surveyor has made a careful study of the whole matter. On June 29 he submitted to the commission a comprehensive proposal of recommendation in the matter of leasing these rights. These were promptly approved in principle. The commission met on July 21, and it was then determined to have a draft made of a resolution covering the conditions on which any lease of water rights would be made. That has been prepared and is now being studied by the members. A meeting for action on this will soon be held. As is well known there are two applicants for a lease. The next step will be the selection of the applicant to which the lease will be given and the submission of the terms following the resolution now being considered. So it will be seen that the commission has not been dilatory. It has been moving along very expeditiously, though carefully."

The State Engineer and Surveyor, Roy G. Finch, also said on Wednesday night that he expected a meeting of the Water Power Commission to be called within the next week or ten days.

Sectional Propaganda Concerning Muscle Shoals

In an effort to block the distribution of Muscle Shoals power throughout the South the opponents of the offer of the associated Southern power companies are circularizing New England, urging that the bill recommended by the joint congressional committee be defeated if New England wishes to stop the migration of the textile industry to the South. If the general distribution of the power can be prevented, it is maintained, it then will be devoted to the manufacture of fertilizers and chemicals and will not make cheap power available to cotton mills and other forms of manufacture which compete with New England. That section will profit if the maximum amount of fertilizer is made, since it will make possible the growing of more cotton, which means cheaper cotton for the textile mills.

The inspiration for this propaganda comes from those most interested in developing the immediate locality of Muscle Shoals. If all of the power can be consumed near the Wilson Dam, it will, they hope, assure the creation of a great industrial community there.

Electragists Gather at Cedar Point

Gerard Swope, Joseph A. Fowler, W. Creighton Peet, G. Fred Laube, Earl E. Whitehorne and Others Address Meetings of Record Size

WITH the largest attendance it has ever recorded, the Association of Electragists International this week held its twenty-fifth annual convention at Cedar Point, Ohio. On Wednesday, the opening day, more than 850 registrations were recorded. In the principal address at the opening session Gerard Swope, president of the General Electric Company, appealed to the electrical contractors of America to put more emphasis on craftsmanship.

"If you are yourself convinced that you are giving a better article and a better service," he said, "you can easily convince your customer that this is true, and the public is perfectly willing and able to pay a fair price for a good article and a good service. But there should also be a fair profit, and if the electragists will learn that, it will strengthen them individually and as an industry tremendously. Obviously no business can be put on a sound basis that does not recognize the various elements of cost, for the danger in business is not from the fellows who get too rich and too large, but from those who do not know their costs and wage their competition on a price basis."

Mr. Swope strongly indorsed the work which the association is doing in raising the standards of business policy and practice, but pointed to the danger of setting up minimum requirements in construction which are likely to become the maximum also.

President Joseph A. Fowler, in his opening address, in reviewing the twenty-five years of the association's work, dwelt upon the consistent effort that has been made to maintain the high standard of the code and discussed at some length the difference of opinion which has developed between the central-station industry and the electragists on the trend of wiring. An adjustment of this divergence of view will, it is hoped, be reached at the coming joint conference in which all four branches of the industry are to participate. Something must be done, Mr. Fowler said, "lest in our eagerness to get every house connected we accept the false philosophy of 'Better to be wired and burnt than never to be wired at all!'" He urged the importance of a conscious responsibility on the part of the contracting industry to defend and promote the present high standards of electrical construction as an insurance of public safety.

The contractor-dealers' medal and purse for 1926 under the James H. McGraw award was bestowed upon Louis K. Comstock for his service to the industry in conceiving and establishing the Council on Industrial Relations. Certificates of honorable men-

tion were extended to Arthur L. Abbott, G. Fred Laube and Charles E. James. (The citations accompanying the award and certificates are printed on page 453 of this issue.)

The presentation was made by Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, who discussed the need for leadership in the new era of market development in the electrical industry. The job ahead, he said, is to influence the American household to appropriate more of the money it is freely spending to the acquisition of electric comforts and conveniences. This to the contractor-dealers means the selling of more adequate domestic installations of the most satisfying quality.

W. Creighton Peet presented the report of the trade committee analyzing the "balance sheet of distribution." G. Fred Laube told a vivid story of success in electrical merchandising, outlining the policies and practices that have built up his electrical department store in Rochester.

A series of practical papers on the technical problems of the contracting business occupied the second day of the convention. The program for Friday called for symposiums on the following questions: "Should there be set up an electragist standard for wiring installations?" and "Is state or municipal licensing of electrical contractors needed, and if so, in what form?" These symposiums will be reported in a later issue.

New England N.E.L.A. Convention Plans

For the eighteenth annual convention of the New England Division, N.E.L.A., to be held at the Poland Spring House, South Poland, Me., Sept. 20-23, a comprehensive program has been prepared. The first general session will be held on Monday evening, Sept. 20, when the retiring president, F. A. Belden will make his address, greetings from the national body will be extended by Vice-president H. T. Sands, E. S. Mansfield will report on education, and Mr. Belden on rural electric service.

On Tuesday there will be commercial sessions under the chairmanship of P. J. Wilson. Merchandising, refrigeration and electric transportation will be discussed in the morning, and power (heavy-duty cooking), contact, industrial heating and lighting in the afternoon. Technical and accounting sessions will be held on Wednesday, G. M. Hardy presiding over the former and W. D. Dyer over the latter. Technical subjects in the morning will include educational courses, meter committee, W. J. Mowbray; accident prevention, A. A. Packard; low-voltage distribution, D. K. Blake, General Electric Company, and H. Richter, Westinghouse company. In the afternoon L. L. Elden will discuss "Forty-Degree Versus Fifty-Degree Motors" and "Operating Economies of the Edgar Station" will be recounted by I. E. Moultrop and R. E. Dillon. The accounting session (W. D. Dyer chairman), in the afternoon, will listen to committee reports as follows: Classification, J. W. Lester; accounts payable, C. Trull; fixed capital, F. J. Stanwood; short-cut methods, P. M. Scott; statistical methods, K. H. Goss; credits and collections, W. E. Dorsey; purchasing and storeroom, W. F. Stevens. On Thursday morning a report on machines for billing and bookkeeping will be made by J. M. Stuart and one on stub accounting by C. J. Allen.

There will also be a women's committee session on Thursday morning (Miss A. M. Baker chairman), with the following topics: "Service," Miss Nan Shay; "What the Isolated Girl Can Accomplish," Miss Mary Lehan; "Co-operation—Loyalty," Miss M. Godfrey; "Introducing Maine," Miss Sue Carr; "How to Reach the Shy and Indifferent Girl," Mrs. E. M. Everett; "Why the Holding Company," Miss M. Chagnot; "Opportunity," W. S. Vivian, and an address by Miss Sara Williams.

A public relations session will be held Thursday evening (H. L. Harris chairman), with remarks by S. T. MacQuarrie and addresses to be announced. An enjoyable entertainment and sports program is also in preparation.

Nation's Part in Developing Her Waters

Hoover Advocates Representative Commissions for Drainage Basins to Co-ordinate Effort and Recommend Course to Congress and State Legislatures

ADDRESSING the Columbia River Basin League at Seattle on Saturday evening, Aug. 21, Secretary of Commerce Hoover made a notable contribution to the discussion of water-resource problems in all their aspects. The subject of his address was "A National Policy in Development of Water Resources," and he dealt with the related questions of inland transportation, irrigation, reclamation, flood control and power, referring incidentally to various existing situations such as those connected with the Great Lakes and with such important rivers as the Mississippi, Colorado, Tennessee, Cumberland, Arkansas, Columbia, San Joaquin, Sacramento, Rio Grande, Hudson and St. Lawrence. Exerpts from his address, particularly from those portions of it which appertained especially to power development, follow:

"Water is today our greatest undeveloped resource. Our streams and rivers offer us a possible total of 55,000,000 hp., and of this less than 11,000,000 hp. has been developed. . . . The discoveries in transmission of electricity now enable distant water power to be brought to a market as a vital contribution to the cost of developments for other purposes. We have emerged from the long postponement of national construction imposed by the war and reconstruction. We have recovered so greatly in national wealth that we now have the capital to compass such projects as our expanding needs require and our undeveloped resources make possible. . . .

"We must no longer think in terms of single power sites, or single storage dams, or single land projects, or single navigation improvements; we must think—and thanks to science and engineering we can think—in terms of the co-ordinated long-view development of each river system to its maximum utilization. We have also to face the regrettable fact that these great possibilities of development of water resources are fast drifting into the muck of litigation, political opposition and interstate quarrels, which could be solved by the determination of broad national programs. Many of the problems are interstate and can be solved by no single local effort."

After alluding in some detail to the differing problems presented by the rivers named above and incidentally indorsing the Boulder Dam project on the Colorado, Mr. Hoover continued:

"An important reason for the determination of definite national policies and plans of development lies in the growing interstate friction, local litigation, political obstruction and even international friction over water questions which are evident in nearly every part of the country. These troubles are themselves an advertisement of the importance of these questions. They are also an advertisement of the lack of either programs or responsible organization or authority. These difficulties are also a vivid testimony of need for a national policy of water development through enlarged storage and stream control. . . .

"The question at once arises of who is to finance and own these great developments. . . . It appears to me obvious that where the major purpose of a given development is navigation or irrigation, reclamation or flood control, then either the federal government or the states or some particular local district must assume the burden and ownership of the permanent works.

"Our problems become more complex when electric power is involved. It is my own view that the federal government should not go into the business of either generating or distributing electric power. There may be some special cases, but our general policy should be against it. Where power is a by-product of dams for other major public purposes such as navigation, etc., then the federal government should lease the power rights so as to recover as much of its total investment as can be, or the whole. Where the development is for power only, then it should be leased under provisions of the federal water-power acts which amply provide for control by the government. Where such major electrical development may in minor part affect the other purposes of irrigation or domestic water storage, etc., then the rights of these users can be protected by conditions in the leases and those acts.

"The federal government cannot completely enter into the business of generating and distributing power for many reasons, one of the least of which is that it cannot secure for isolated blocks of power such a diversity of

load that it will yield a high daily load factor and consequent maximum use. That can be obtained only through our large interconnected power systems. The regulation of our utility rates to protect the public is the responsibility of our state governments. . . .

"One of the primary requirements to a national advance in these questions is better organization, both for determination of plans and for their execution. I hesitate to discuss the subject because it presents such an appalling picture of what is otherwise a very efficient nation. Our first need is complete engineering studies of every drainage that we may have the basic facts upon which to determine engineering plans. We already have such information but in no case complete. Our second need is organization to determine a procedure and to co-ordinate interests. . . . I should like to see a commission set up separately on each of these great drainages, on which not only the federal government but also state governments concerned could be represented and which would also include independent technical members. I would not give to these commissions the power and task of spending money, of construction or administration. We have efficient engineering corps in our federal and local governments for technical determinations, and the execution of construction can be administered through existing agencies of the government or by way of federal contributions to the states or districts.

"The job of these commissions should be to consider the engineering data, to think, to plan, to devise, advise, coordinate, negotiate, persuade and repress the obstreperous. They should determine major lines of policy to be undertaken; they should organize the financial support and recommend what administrative bodies—national, state or local—should undertake execution (if they are governmental works), and they should make recommendations to Congress or state legislatures for action. We have small beginnings of such organizations in the Lower Mississippi commission, the Colorado commission and the St. Lawrence commission. We require no extension of the basic authority, for under the federal control of navigation, power and public lands, together with the state water laws, we have enough authority to stop almost anything even if we cannot move forward. By these means we could thus resolve our problems into their regional character, build them upon regional knowledge and regional support. We could come to conclusions and plans around which all elements could rally for effectual action. . . .

"A plan such as I have outlined follows the essential principles of good administration and sound public action. It separates the advisory and the judiciary questions from administrative and executive questions. In the former we need the value of many minds in order to secure the best judgment and widespread co-ordination and co-operation. In execution we need single-headed responsibility. Our national development will be advanced by many years and executed at much less cost if such organization can be brought about."

Five-System Power Loop

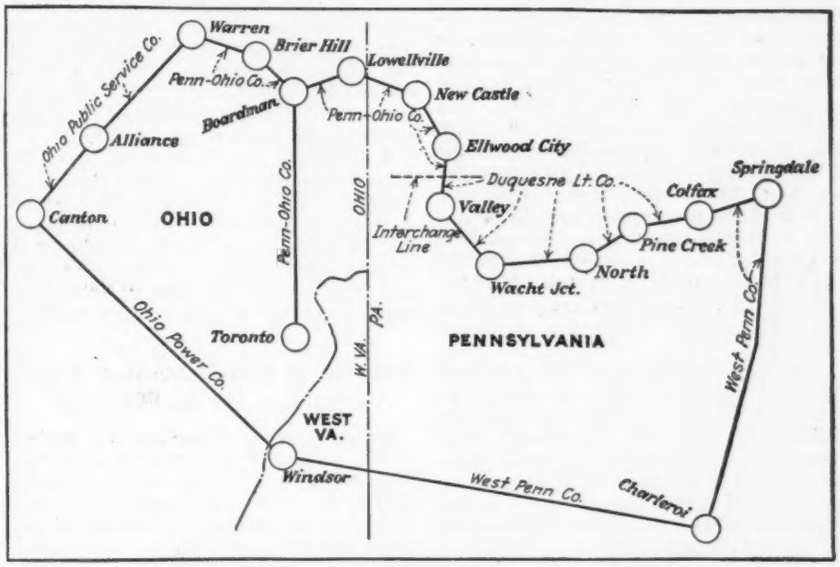
With Circumference of 300 Miles, It Joins Plants in Ohio, Pennsylvania and West Virginia

RECENT completion, as already noted in these columns, of a 12-mile high-tension line between Ellwood City and New Brighton, Pa., has put into commission a five-system power loop with a circumference of 300 miles which makes possible an interchange of power as occasion arises in one of the greatest industrial districts of the world. The five companies whose lines are thus interconnected are the Duquesne Light Company, the West Penn Power Company, the Ohio Power Company, the Ohio Public Service Company and the Pennsylvania-Ohio Power & Light Company. These five systems have a combined rating of 750,000 kw.

An official publicaton of the last-named company thus outlines the territory bounded by the new loop:

"Taking our boardman substation as a starting point, going eastward and returning to the center of our system from the west, the route of this great power loop follows: From Boardman east to the Lowellville power station, to New Castle, to Ellwood City and thence south to the Daugherty township line in Beaver County where the Penn-Ohio line and that of the Duquesne join, then on southward to the Valley substation at New Brighton, to the Colfax and Springdale power stations, over to Charleroi and thence to the Windsor power station, and on to Canton, Alliance and Warren and to the Evergreen substation of the Ohio Public Service Company, just east of which the junction is formed with our lines again and the loop is completed with the transmission lines to the Brier Hill substation and thence to Boardman."

Further connections to the east are made through lines tied in with the West Penn and to the west through the connections of the Ohio Public Service Company, the Northern Ohio Power & Light Company, the Cleveland Illuminating Company and other systems, extending into the Mississippi Valley. Incidentally, as before recorded, the closing of the 12-mile gap formed the last link in interconnections of greater or less capacity which extend from Boston to Chicago and St. Louis through the Pittsburgh-Youngstown-Cleveland section.



ROUTE OF 300-MILE POWER LOOP BINDING FIVE SYSTEMS

Program of Pennsylvania Electric Convention

Reports from officers and committees will fill the greater part of the day when the Pennsylvania Electric Association, meeting at Bedford Springs, Pa., begins its sessions on Thursday, Sept. 9. In the afternoon, however, there will be two addresses—one by H. V. Bozell of Bonbright & Company, New York, and the other by William E. Mitchell, vice-president Alabama Power Company. At a public policy meeting on Thursday night, when W. H. Johnson, president Philadelphia Electric Company, will preside, the speakers will be R. F. Pack, president of the National Electric Light Association; P. H. Gadsden, vice-president United Gas Improvement Company, and John L. Stewart, member of the Public Service Commission of Pennsylvania.

On Friday morning there will be a joint accounting and public relations session with addresses by Dr. T. J. Grayson, director of evening schools, University of Pennsylvania; Gerard Swope, president of the General Electric Company, and M. S. Sloan, president of the Brooklyn Edison Company. In the afternoon, at the commercial session, the speakers will be Frank Jewel Raymond and Prof. E. A. Stewart of the University of Minnesota, who is nationally known because of his work on rural electrification. This year the convention will close Friday night, the election of officers taking place at one of the earlier sessions instead of going over to Saturday morning, as in former years. An excellent entertainment program is promised.

Federal Power Board News

Permit for Savannah River Project—Flood Control and Water Power—Saluda River Dam

ISSUANCE of preliminary permits to the Twin City Power Company and to another corporation, known as the Twin City Power Company of Georgia, covering a proposed undertaking on the Savannah River at Price's Island in McCormick County, S. C., and in Lincoln County, Ga., has been authorized by the Federal Power Commission. Plans provide for the construction of a 70-ft. dam across the river at the lower end of Price's Island. This will back water upstream for a distance of 22 miles. The primary power which thus will be made available is 30,000 hp. The applicants propose to install equipment sufficient to develop 65,000 hp. The river has been improved for navigation, but the Chief of Engineers has approved the project provided the interests of navigation are properly safeguarded.

If the Los Angeles County Flood Control District will execute a stipulation covering the possible future development of power by the district, or by others with its consent, in connection with its proposed flood control project on San Gabriel River, the Federal Power Commission will grant the necessary rights-of-way coming within its jurisdiction. At its meeting on Aug. 19 the commission took the view that the proposed use of the reservoir for the main purpose of flood control and irrigation is consistent with the most beneficial development of water resources and committed itself to grant the right-of-way under the condition mentioned.

The commission also agreed to extend by ninety days the period which the Susquehanna Power Company and the Philadelphia Electric Company may have for the submission of the prelicense cost of the Susquehanna project. Unavoidable delays have occurred in the obtaining of the necessary information as to certain expenditures, obligations and liabilities incurred by or on behalf of the licensees prior to the date of the license. The Public Service Commissions of Maryland and Pennsylvania are agreeable to this extension.

A preliminary permit was authorized for the Lexington Water Power Company at Columbia, S. C. This permit covers a project in the Saluda River in Lexington, Newberry and Saluda Counties. It is proposed to construct a dam 93 ft. high and a power house to contain four 12,000-hp. units. The Chief of Engineers has approved the project.

The commission authorized a preliminary permit for the Prairie Power Company of Prairie City, Ore., covering a project on Strawberry Creek, a tributary of the John Day River. The proposed development will include the construction of two small diversion dams.

A preliminary permit was authorized for the Royal Development Company of Butte, Mont., covering a project on Phelps Creek, in Chelan County, Wash. The water is to be diverted to an existing power house, which will be enlarged to accommodate equipment sufficient to deliver 2,550 additional horsepower. The power is to be used for mining.

A license was authorized for the Best Flume & Power Company of Pinedale, Wyo., covering a constructed project on Pine Creek. Power is developed by a 65-hp. waterwheel and conveyed by transmission line 9,500 ft. to the town of Pinedale. Although Pine Creek is a tributary of streams flowing into the Colorado River and consequently comes under the resolution suspending action on applications in this territory, it was felt that the resolution should not apply to this project, which involves no storage.

A license also was authorized for the Kent Hydro-Electric Company at Dam No. 7 on the Kentucky River.

An amendment to the license of the Molybdenum Corporation of America was authorized. The original license was issued July 26, 1923, for a project on Red River in New Mexico. The development involves only 300 hp. The amendment allows an extension of two years for the completion of construction.

An extension of one year has been given Charles W. Thuringer in the period for compliance with the terms of his preliminary permit covering a project on South St. Vrain and Left Hand Creeks in Boulder County, Col. The existing permit expired Aug. 7.

A proposed development by Fred D. Allard on the Foss River in King County, Wash., is regarded as of doubtful feasibility by the Forest Service. The applicant has not submitted satisfactory evidence to the contrary, and the commission has rejected the application for a preliminary permit.

American and Canadian Engineers Confer on Niagara

Major General Edgar Jadwin, acting as the technical representative of the United States, recently conferred with Colonel O. M. Biggar, representing the Dominion of Canada, in regard to the scope of the work proposed to prevent further recession of the crest of Niagara Falls. The conference was tentative in character. While in Canada General Jadwin also attended a meeting of the International Joint Engineering Board which is writing a report on the cost of some of the principal structures which would have to be built in the development of the power resources of the St. Lawrence. Rapid progress has been made on the report, General Jadwin says.

The United States originally proposed that the work at Niagara Falls be undertaken solely with the view of preserving the scenic beauty of the Falls. Canada, in reply, suggested that the conference consider also an increase in the diversion of water for power purposes. In the meantime, however, the urgent need which did exist on the Canadian side for additional water power has been met otherwise. This leads to the hope that early steps may be taken to check recession without opening up the highly controverted question of the division between the two countries of the water diverted for power purposes.

Purchases and Mergers

Proposed Pennsylvania Merger Reaches Commission—Middle West Consolidations—City Plants Bought

PLANS for the merger of the Philadelphia Suburban Gas & Electric Company, the Counties Gas & Electric Company and sixteen smaller electric light and gas companies operating in Bucks, Delaware and Montgomery Counties, Pa., involving securities and other assets valued at $46,000,000, are now before the Pennsylvania Public Service Commission for approval. This proposed merger of companies controlled by the United Gas Improvement and American Gas companies was referred to in the ELECTRICAL WORLD for July 17, page 135. Plans for the consolidation call for all of the companies to operate as the Philadelphia Suburban Counties Gas & Electric Company. The company would be capitalized at 650,000 shares of stock of no par value.

The Milwaukee Electric Railway & Light Company has made application to the Wisconsin Railroad Commission for permission to consolidate the Wells Power Company with its properties in Milwaukee. The Wells Power Company originally supplied electricity and steam heat over a limited area in the east side business district. Several years ago all the stock of the company was acquired by the Milwaukee Electric, which has been operating the Wells company plant under contract.

The Southern Nebraska Power Company has purchased the Harvard Electric Company's plant at Harvard, Neb., where there has been some agitation for municipal operation. The franchise has three years to run.

The Central West Public Service Company has purchased the J. F. Kelly electric light plant and system in Britton, S. D., and will continue its operation.

The Bell Electric Company, which has been selling and distributing electricity to retail consumers in the city of Auburn, Cal., and adjacent unincorporated territory, has been authorized by the California Railroad Commission to sell its property to the Pacific Gas & Electric Company.

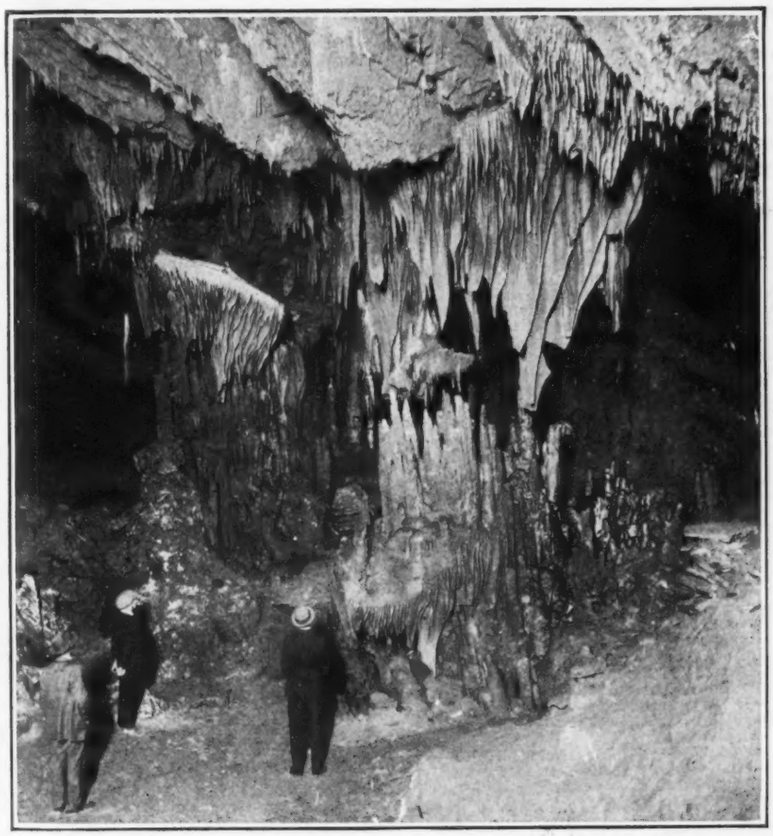
Acquisition of municipal plants continues to be reported in the South. The Carolina Power & Light Company of Raleigh, N. C., has purchased the municipally owned Warrenton Electric Light Company and has arranged to buy the municipal lighting plants at Littleton, Norlina and Bladenboro. The local municipal light plant at Punnell, Fla., will be sold to the Florida Power & Light Company, according to action taken by the City Commission, and will be connected with the high-voltage line from Daytona Beach. The South Georgia Power Company has purchased the light and power plant of Reynolds, Ga., and has extended its lines to that place. In addition, the South Georgia Power Company has closed contracts to take over the municipal electric light and power properties in Cuthbert, Shellman, Dawson, Marshallville, Perry, Cochran, Unadilla, Ocilla and Vienna.

The City Council of Ord, Neb., has received an offer from the Nebraska Electric Power Company of Davenport, Iowa, which operates in Loup City and

other Nebraska towns, to purchase the municipal electric plant for $90,000.

The Northwestern Light & Power Company has offered $125,000 for the Sibley (Iowa) light plant and will seek a franchise to supply the city with power. The utility company has offered to pay expenses of a special election if the Council will submit the offer to the people.

Lighting Up the Grand Caverns at Grottoes, Virginia



FOR three-quarters of a century the wonders of the Grand Caverns at Grottoes, Va., were viewed by the feeble flames of torches and lanterns. A crude electric lighting system followed which enabled visitors to see something of the marvels close at hand but left the recesses in darkness. Very recently a scientific lighting system has been installed which outlines this fairyland in high lights and shadows, silhouettes its natural sculpture against bright and colorful backgrounds, mirrors it in reflecting pools, spotlights choice crystalline formations, brings forth the gorgeous natural colors and occasionally introduces delicate color effects.

The work involved more than artistic creation. First it was necessary to design and install a reliable and convenient distribution and switching system. Recognizing the infinitude of the lighting possibilities and the endlessness of the task, sufficient equipment for adding lighting effects for years to come was installed. This includes five transformers, with a total rating of nearly 200 kw., placed at strategic points. Each of these is connected to 2,300-volt lead-sheathed lines. At each transformer there is a 300-amp. magnetic switch. Three-way switches at convenient places operate these magnetic switches. In this way the lighting of each main section of the caverns is easily controlled when entering or leaving it. In addition many miles of lead-sheathed wire is concealed throughout the caverns. Only standard "Mazda" lamps are used, but strikingly beautiful effects are obtained by a judicious use of daylight and flame-tint lamps and the occasional employment of glass color caps.

It requires more than an hour to traverse the caverns. Their successively revealed beauties include "Solomon's Temple," illuminated by a huge floodlight; the "Ballroom," with the true colorings of distant recesses brought out by daylight lamps; the "Senate Chamber," where colored lighting throws into relief an exquisite grotto of stalactites and stalagmites; the "Cathedral," 260 ft. long and 60 ft. high, where on top of a huge formation banks of reflectors illuminate the richly formed walls and ceiling; the "Alpine Sky," whose colors daylight lamps bring out while flame-tint lamps enrich the reddish horizon; the "Capitol Dome," the "Grand Canyon," "Jackson Hall," the "Tower of Babel," the "Bridal Chamber," the "Garden of Eden" and many other attractions.

For the particulars of this unusual lighting installation the ELECTRICAL WORLD is indebted to M. Luckiesh and E. W. Commery of the lighting research laboratory of the National Lamp Works.

Briefer News

Western Oklahoma Electric Men to Meet Sept. 14.—The annual conference of the western district, electric light and power division, of the Oklahoma Utilities Association is to be held at Lawton Sept. 14. Co-ordination of electric and telephone service will be among subjects considered.

High Water Retards Work on Falls of Ohio Dam.—Unprecedentedly high water due to heavy rains at the Falls of the Ohio, where the Louisville Hydro-Electric Company is building a dam, caused much of the work to be flooded out last week, water getting behind the cofferdams, and in consequence the engineers decided on Aug. 20 to flood the whole site rather than try to pump the water out. The flood began to recede the next day, and operations will not be long delayed.

Further Delay in Denver Election Likely.—Though the statistical work in connection with the city's valuation of the Public Service Company of Colorado's property in Denver and neighboring towns is progressing, it is now realized that it may be several months before the company's application for a franchise renewal can be placed before the people at a special election, according to officials of the company. Many details must yet be worked out as well as a rate schedule.

Chicago Will Soon Have 22,500 "Novalux" Street-Lighting Units.—With the addition of 7,000 more ornamental "Novalux" street-lighting units, which will be in operation by Dec. 15 of this year, Chicago will have a total of 22,500 of these lamps, sufficient to illuminate more than 500 miles of streets. They are 250-cp. General Electric "Mazda" lamps in alabaster rippled globes, mounted on 12-ft. concrete octagonal poles. This installation of 22,500 units is the first step in a plan for relighting the entire city.

Old Searchlamp Cuts Worcester's Auto Thefts in Half.—A 30-in., 43,000,000-cp. Thomson-Houston searchlamp, built more than 30 years ago by a predecessor of the General Electric Company, is credited with having been instrumental in reducing by half the number of automobile thefts in Worcester, Mass., where it has been used as a police signal since last spring. Members of the police force watch for flashes from the light and on seeing its beams learn from the nearest patrol box the available details of the theft. The light is then turned on the section where the crime was committed.

High-Tension Line Between Okmulgee and Tulsa Under Way.—The Oklahoma Power Company is constructing a 60,000-volt transmission line northward from Okmulgee to its central power station on the Arkansas River near Tulsa, about 35 miles distant. Okmulgee and the transmission lines radiating from that city are already

supplied by the Tulsa power station through connected lines of the Oklahoma Power Company and Oklahoma Gas & Electric Company, but these lines have proved inadequate.

Grafton, N. D., Not Ready to Sell Municipal Plant.—By a majority of 125 the citizens of Grafton, N. D., have voted to retain the municipal electric light and power plant rather than sell it to the Otter Tail Power Company of Fergus Falls, Minn., which has made a standing offer of $125,000 for the plant and also promised to make Grafton a distributing point. Grafton has a population of about 3,000.

Ten-Year Exemption of New Hydro Plants from Taxation Proposed in Louisiana.—A constitutional amendment adopted at the late session of the Louisiana Legislature for submission to the voters provides, among other things, for the exemption from taxation for ten years after completion of the projects concerned of the property of any corporation owning and operating within the state a combined system of irrigation, navigation and hydroelectric power, provided that not less than three million dollars shall be expended on such plant prior to Jan. 1, 1932.

Lighting the Airways.—Ninety 24-in. revolving searchlamps have been ordered by the government Air Service for installation on seven mail routes, where they will be placed at 10-mile intervals. They will be supplied by the Sperry Gyroscope Company of Brooklyn and will cost $467 apiece. The normal visibility of the lights during favorable weather is said to be 50 miles, and under ordinary conditions a pilot will be able to see three or four of them while in flight. Present plans of the Division of Commercial Aviation in the Department of Commerce provide for the complete lighting of the New York-Boston route and the placing of beacons along the unlighted portions of the St. Louis-Chicago, Dallas-Chicago, Salt Lake City-Los Angeles, Pasco-Elko, Chicago-Minneapolis and Cheyenne-Pueblo routes.

Ambitious Project for Central Nebraska.—Dean O. J. Ferguson of the College of Engineering at the University of Nebraska has concluded his check-up of the combination water-power and irrigation development in central Nebraska known as the "Tri-County" project, for which a preliminary permit has been issued. The plant involves the impounding at two points in Gosper and Phelps Counties of floodwaters that would serve the double purpose of generating electricity and irrigating the subsoil. Dean Ferguson says that the plan will result, using both reservoirs, in the development of 179,220,000 kw.-hr. per year and that the possible annual output of the two plants would equal 50 per cent of all the electricity consumed in Nebraska at the present time. From the standpoint of power generation he is satisfied that the project is economically sound; the major question is the market for energy.

Washington Water Power Company's New High-Voltage Line.—Construction of a 110,000-volt transmission line a distance of 67 miles from a substation south of Spokane to Mullan Junction, in the Cœur d'Alene mining district, for the Washington Water Power Company is now nearly completed. All but four miles are operating at 60,000 volts and will continue to do so until substation equipment is installed for the higher voltage. The arrangement eventually will place 126 miles of new transmission lines at 110,000 volts in operation. Interconnection will be possible from Montana, through Idaho and across the State of Washington, using the lines of the Montana Power Company, the Washington Water Power Company, the Chicago, Milwaukee & St. Paul Railway and the Puget Sound Power & Light Company. Forty miles of 60,000-volt line from Coulee to Chelan, Wash., was raised by the Washington Water Power Company to 110,000 volts early in August.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

Camp Co-operation VI (local leagues) —Association Island, Henderson Harbor, N. Y., Sept. 1-4. (Society for Electrical Development, New York, is sponsor.)

Wisconsin Utilities Association, Electric Section—Eau Claire, Wis., Sept. 3 and 4. J. N. Cadby, 445 Washington Bldg., Madison, Wis.

American Institute of Electrical Engineers — Pacific Coast convention, Hotel Utah, Salt Lake City, Sept. 6-9. F. L. Hutchinson, 33 West 39th St., New York.

Illuminating Engineering Society — Essex and Sussex Hotel, Spring Lake, N. J., Sept. 7-10. L. H. Graves, 31 West 46th St., New York.

Pennsylvania Electric Association — Bedford Springs, Pa., Sept. 8-10. H. A. Buch, 212 Locust St., Harrisburg.

Rocky Mountain Division, N. E. L. A. —Glenwood Springs, Col., Sept. 13-16. O. A. Weller, Public Service Co., Denver.

New England Division, N. E. L. A.— Poland Spring House, Poland, Me., Sept. 20-23. Miss O. A. Bursiel, 149 Tremont St., Boston.

International Association of Municipal Electricians — Battery Park Hotel, Asheville, N. C., Sept. 21-24. E. H. Benz, West New York, N. J.

Great Lakes Division, N. E. L. A.— French Lick, Ind., Sept. 23-26. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

Wisconsin Chapter, Western Section International Association of Electrical Inspectors—Milwaukee, Sept. 27 and 28. Harvey Griem, City Hall, West Allis, Wis.

Association of Edison Illuminating Companies — Chateau Frontenac, Quebec, Sept. 27-Oct. 1. P. S. Millar, 80th St. and East End Ave., New York.

Public Utilities Association of West Virginia—Charleston, W. Va., Oct. 1 and 2, A. Bliss McCrum, secretary.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 4 and 5. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association —Cleveland, Oct. 4-8. J. W. Welsh, 292 Madison Ave., New York.

American Electrochemical Society — Hotel Washington, Washington, Oct. 7-9. C. G. Fink, Columbia University, New York.

North Atlantic Section, American Society of Agricultural Engineers— State College, Pa., Oct. 11-13. R. T. Wagner, 1 River Road, Schenectady, N. Y.

Kansas Section, N. E. L. A.—Manhattan, Kan., Oct. 14-16. H. Lee Jones, 401 National Reserve Bldg., Topeka, Kan.

Electrical Supply Jobbers' Association — Atlantic City, Oct. 18-22. F. Overbagh, 411 South Clinton St., Chicago.

Electric Power Club—Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Don Pedro Plant May Be Enlarged.—A recommendation that two additional power units be installed in the Don Pedro power plant of the Turlock and Modesto Irrigation Districts in California has been made by the engineers of both districts. The cost is placed around $750,000. The addition of these two units will double the capacity of the Don Pedro power plant, permitting better service and at the same time giving a reserve capacity now lacking. About three years have gone by since the Don Pedro plant commenced operations, and the plant has to operate its three units almost continuously, with the result that it is difficult to shut down a machine for inspection or repairs.

Unusual Installation of Transformers.—The Philadelphia Electric Company has recently installed in its Schuylkill station the largest self-cooled single-phase transformers constructed to date. The total capacity is 120,000 kva. in two banks and the complete transformers were shipped assembled in their permanent tanks, immersed in dry oil, thus eliminating the usual drying process. They are of General Electric manufacture, being of the standard-core, circular-coil construction used by that company. The unit rating is 60 cycles, self-cooled, 20,000 kva., 72,450 volts Y to 13,800 volts delta. The equipment controls a tie line between the Schulykill and Chester stations of the Philadelphia Electric Company. Similar provision for voltage variation had been made at the Chester end of the line some time ago, and the combination affords a flexibility of operation which is extremely valuable, owing to the constant variation in power demand at the respective stations.

Extensive Interconnection in Kansas.—Transmission lines of the United Power & Light Corporation, Abilene, Kan., serving more than 140 towns, will be interconnected with the lines of the Kansas Power & Light Company, Topeka, on completion of a line between Atchison and Seneca, company officials have announced. The Atchison-Seneca line, 72 miles in length, will operate at 33,000 volts. When it is placed in service all the properties of the two companies will be interconnected with the exception of the groups at Olathe and Goodland. The latter is situated in the extreme northwest, near the Colorado border. Announcement also is made of intention to construct an additional transmission line up the Kaw River valley, forming a direct interconnection between the main lines of the United system running west from Manhattan and the new Tecumseh station of the Kansas Power & Light Company, which recently acquired a controlling interest in the United organization.

Men of the Industry

Samuel Insull, Jr., has been elected president of the Midland Utilities Company, an Insull concern whose subsidiaries supply electric, gas and transportation service in about 150 communities, mainly in northern Indiana. The son succeeds his father, who becomes chairman of the board of directors. Samuel Insull, Jr., has been vice-president of the company with executive supervision.

E. S. Mansfield, formerly superintendent of operating bureau accounts with the Edison Electric Illuminating Company of Boston, has been placed in charge of the newly established educational bureau of that company. Mr. Mansfield, who has been with the Boston Edison since 1896, had been since 1913 in the position he has just relinquished. Previously he had been head of the correspondence division, in charge of the real estate of the company, head of the statistical division and in charge of the electric vehicle division. He is a graduate of the Massachusetts Institute of Technology, from which he holds the degree of electrical engineer.

Frank A. Belden has succeeded E. S. Mansfield as superintendent of operating bureau accounts with the Edison Electric Illuminating Company of Boston. Born in Illinois, educated in that state and at the University of Wisconsin, commencing his business career with the Georgia Railway, Light & Power Company at Atlanta and pursuing it in Chicago, New Hampshire and Massachusetts, Mr. Belden joined the Boston Edison forces in 1925 as assistant to the general superintendent, going to Boston from Portsmouth, N. H., where he had been vice-president and general manager of the Rockingham County Light & Power Company. He was president of the New England Division, N.E.L.A., for the year ended last June.

L. E. Fischer Made Vice-President of North American Light & Power

L. E. Fischer of St. Louis, a well known transportation and public utility executive, has been appointed vice-president in charge of operation of the North American Light & Power Company, according to an announcement by Clement Studebaker, Jr., president of the company, from his offices in Chicago. The new operating executive of this large public utility group is younger in years than in experience. He was the first general manager of the Illinois Traction System, which with its supplemental group of public utility properties was under his management from 1903 until 1909. The experience which fitted him to be the executive official of the Illinois Traction System at the age of 27 years included preliminary training in the St. Louis Manual Training School, B.S. and C.E. degrees at the University of Illinois, a term as assistant city engineer at Kewanee, Ill., also as city engineer at Paris, Ill., and later as superintendent and manager of the Danville (Ill.) electric, gas and street-railway properties of the Illinois Traction System. After his resignation as vice-president and general manager of the Illinois Traction System in 1909, Mr. Fischer established a consulting engineering organization in St. Louis, where he has had an important part in the planning, construction and operation of many public utility, civic and industrial engineering projects.

L. E. FISCHER

Obituary

Hugh A. Tait, who had been connected with the legal staff of the Puget Sound Power & Light Company and its predecessors since 1904, died suddenly July 4. Mr. Tait was born in Hillsboro, N. C., Nov. 3, 1869, and was educated in the South. On account of ill health he removed to Utah, where he studied law, subsequently establishing a practice in Seattle. After serving as Assistant Corporation Counsel of that city in 1903 and 1904, he joined the legal staff of the Seattle Electric Company and remained with that company and its successors until the time of his death.

Russell A. Willson, a pioneer of the electrical industry of the United States and a veteran of 21 years' experience in executive positions connected with the light and power as well as street-railway organizations of Spokane, died Aug. 19 at his home in that city in his sixtieth year. Mr. Wilson in the fall of 1905 became assistant to the general Power Company. His promotion to the position of general superintendent of the railway department followed in 1908, which position be held until 1922, when the Spokane Traction and the Washington Water Power street railways were consolidated. At that time he was made assistant general manager of the Spokane United Railways, the office he occupied at the time of his death. Mr. Wilson was born in 1866 in Ishpeming, Mich., and after engaging in engineering work at Florence, Wis., and later with the Chicago & Northwestern Railroad and the Chicago, Milwaukee & St. Paul Railway, he returned to his native city to take charge of the first electric light and power plant there. Subsequently he removed to Marquette, where for nine years he had full charge of the city's light and power system.

Edgar Kidwell, mechanical engineer and consultant for the Kidwell Boiler Company, Milwaukee, died on July 9 at his home in Berkeley, Cal. A graduate engineer of the University of Pennsylvania, Mr. Kidwell taught engineering before entering upon his business career. Following graduation he was affiliated with the University of Pennsylvania as instructor of mechanical engineering and later joined the staff of the Michigan College of Mines as professor of mechanical and electrical engineering. More recently he had served in various engineering capacities for several industrial and machinery manufacturers. Professor Kidwell had been a frequent contributor of technical articles to a number of engineering journals.

Ernest Thurnauer, managing director of the French Thomson-Houston Company for two decades and at the time of his death a director in two Milan companies affiliated with the International General Electric Company—The Compagnia Generale di Elettricità and the Società Edison Clerici—died on June 25 in Paris, at the age of 63. Mr. Thurnauer, who, born at Nuremberg, Germany, became in early life an American citizen, obtained his first practical experience in electricity at the shops of the Thomson-Houston Electric Company in Lynn, Mass. In his early twenties he was one of the "expert" group who installed the dynamos and arc lamps of those days. He installed a generating and distributing system in Hammerfest, Norway, within the Arctic Circle. He then became his company's engineer at Hamburg, and during several years he installed plants in various parts of Europe and supervised their operation, taking a leading part in the installation of an arc-lighting system at Milan and in the Thomson-Houston exhibit at the Paris Exposition of 1889. While at Paris he effectively furthered the association of French interests that led to the establishment of the Compagnie Française Thomson-Houston, which succeeded to the French patents, rights and good will of the American company. This company began its corporate existence under Mr. Thurnauer's direction in December, 1892, and he lived to see its capital grow from a million to three hundred million francs. An able financier and executive, as well as a linguist and cosmopolite, he not only built up the French company but played a prominent part in electrical development also in Italy, Greece, the Iberian peninsula and other lands. For several years he was on the directorate both of the British Thomson-Houston Comany and the Allgemeine Elektricitäts-Gesellschaft of Berlin. His travels in the interest of his company took him to Japan and around the world.

Recent Court Decisions

Arbitrary Action of Commission in Overruling Favorable Engineering Report Disapproved. — The Supreme Court of Kansas has sustained an action in Jackman et al. vs. Public Service Commission in which the plaintiffs, owners of a dam across the Kansas River, sought to compel the commission to approve or give a hearing upon their plans for repairs, additions and betterments. The plantiffs said that a committee of engineers appointed by the commission had submitted a favorable report on these plans but that the commission had refused approval and denied a request for findings of fact. The commission contended that it had full discretion to grant or refuse the request and that its conduct in that regard is not subject to judicial control under the laws of Kansas. (245 Pac. 1047.)*

Negligent Maintenance of High-Voltage Wires a Jury Question.—Weishaupt vs. Union Gas & Electric Company was a suit for damages because of injuries received by the plaintiff when a 2,400-volt wire in Cincinnati fell and he came into contact with it. The company claimed that the wire was properly erected and maintained, that it fell during a high windstorm and that the plaintiff's injuries were caused by his own negligence in taking hold of it. The plaintiff asserted that the company's wires were in such close proximity to trees that during the storm the branches forced one wire against another, causing an arc, and that the same thing had happened before and its repetition had not been guarded against. Sustaining a verdict for the plaintiff, the Court of Appeals of Ohio held that the question of negligence involved had properly been submitted to the jury, the question at issue being one of fact. (152 N.E. 677.)

Mandamus to Force Compliance with Commission's Orders Refused. — The Kansas Gas & Electric Company was ordered by the Public Service Commission of Kansas to "refrain from in any way interfering with the public service already maintained and established by the Kansas Utilities Company and from in any way establishing, or undertaking to establish and maintain, a transmission line in the territory throughout which the Kansas Utilities Company has been authorized by this commission to operate and is now operating, and especially in Allen County, Kan., until authorized to do so by this commission." Thereupon the Kansas Gas & Electric Company began an action against the commission in the District Court to enjoin the enforcement of the order and obtained a temporary restraining order. The commission brought original proceeding in the Supreme Court of the State for mandamus to require the company to comply with its order. In holding that the proper proceeding was by injunction and not mandamus, and dismissing the proceeding, the court said: "The question now before us is one of jurisdiction. If the term 'mandamus,' as used in the constitution, applies only to a proceeding to require the performance of an act, and not to one to prevent action, this court has no power judicially to pass upon the merits of the plaintiff's application. And the court holds that to be the case. It is true the purpose of the order here sought may be described as being to require the gas and electric company to obey the order of the Public Service Commission, but we are asked to compel such obedience by forbidding the company to extend its operations into certain territory. The difference between commanding and forbidding action is substantial. If the essential quality of a prohibition against a line of conduct could be altered by describing it as a command to refrain therefrom, any injunction against violations of a duty resulting from an office, trust or station could be sought by original proceedings brought in this court under the name of mandamus."

City of St. Louis Cannot Impose Tax on Utility Franchises. — The Missouri Supreme Court has held that the St. Louis city assessor had no legal right to levy an assessment on the franchise of the Union Electric Light & Power Company or its subsidiary, the Cupples Station Light, Heat & Power Company. The ruling nullifies an assessment of $5,000,000 on the Union Electric and $150,000 on the Cupples Station franchises, both of which were made in 1924 for taxes payable in 1925. About $130,000 a year in taxes is affected. The utilities in a suit against the city contended that the power to assess their franchises lay with the Missouri Tax Commission and State Board of Equalization rather than with the city assessor. This view is upheld by the high court.

Dwelling House Encroaching on Right-of-Way Is an "Obstruction."— Under the grant of a right-of-way to a power company entitling it to operate its lines thereon, with the right to keep it clear of trees and undergrowth and other "obstructions," the Supreme Court of Alabama has held, in Collins vs. Alabama Power Company, that a dwelling house built so as to encroach on the company's right-of-way to a point 10 ft. or 15 ft. within one of its lines was an obstruction which the power company was entitled to remove. The term "danger trees," such trees being named in the grant as obstructions the company might remove, was interpreted by the Supreme Court to mean trees which by reason of size, condition and contiguity to right-of-way involved a concrete threat of injury to the company's lines, including trees which had come to be dangerous since the grant was made. In cutting such trees the power company assumes the burden of correctly ascertaining their nature and cutting only such trees as fall within the grant. (108 So. 868.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Commission Cannot Order Reimbursement of Customer Who Purchases Own Transformers. — In a complaint brought against the Lehighton Electric Light & Power Company by W. F. Hoffard reimbursement was sought of the price of transformers purchased by the latter and installed by the company. The case was dismissed, the Pennsylvania Public Service Commission maintaining that it had no jurisdiction.

Rules Controlling Stock Dividends.— The California Railroad Commission, asserting that it has no power to authorize the issue of stock for the purpose of paying dividends, went on to say, in a decision affecting the San Diego Consolidated Gas & Electric Company, that it can, upon a proper showing, authorize the issue of stock for the purpose of reimbursing a company's treasury on account of surplus earnings invested in the property, and the company, after reimbursement, can then declare the stock as a dividend limited by the amount of the surplus. Such stock must not be distributed as a dividend in excess of the surplus account, even though the investment of earnings be in excess of the surplus, where the excess is offset by reserves or accrued liabilities not due.

Donated Transmission Lines Not Taxable Within Federal Income Law.— The Liberty Light & Power Company of Richmond, Ind., which supplies electrical energy in Indiana and Ohio, received contributions in the total sum of $10,500 from rural residents of its territory toward the construction of farm lines which became the property of the power company. The Commissioner of Internal Revenue held these lines to represent income subject to federal taxation, but has been overruled by the Board of Tax Appeals, which said: "The most that can be said in respect of these transmission lines is that they were contributed by the citizens to the capital of the taxpayer. They were certainly not payments for service rendered or to be rendered."

New Line Construction to Serve Old Customer Not Invasion of Territory.— The Pennsylvania Public Service Commission in approving certain contracts entered into between the York Haven Water & Power Company and several municipalities which authorized the company to construct a high-tension transmission line across certain highways to serve an industrial plant, upon the condition that no service be rendered from such line except to that plant, overruled the objection of the Harrisburg Light & Power Company that the line contemplated would be an infringement upon its territory. The commission held that since the York Haven company already served the consumer in dispute (the Bethlehem Steel Company) and the facilities of its rival were inadequate to handle peak demands, no invasion was involved.

Financial and Corporate

Small Recessions Prevail

Fluctuations on Exchange Counteracted by Utility Gains in Outside Market

ALTERNATE strength and weakness marked transactions in power and lighting stocks in the week just closed. Favorable news, such as satisfactory earnings statements of the more prominent holding companies, failed to affect materially the trend of prices, and at the close values in most instances were established at levels moderately below the previous period. While this condition was particularly true of listed securities, those on the counter market, especially senior securities, presented a sharp contrast to the gyrations of kindred shares on the New York Stock Exchange and curb market.

On the latter exchanges Brooklyn Union Gas and General Electric, both pronouncedly strong favorites in recent sessions, registered declines of four and one-quarter and four points respectively. Consolidated Gas, American Water Works and Electric Investors, Inc., underwent modest losses. United Gas Improvement reacted two points. Strength in U.G.I. in the last month or so was attributed to the belief in some circles that the company may acquire control of several new properties, thereby entering upon the initial move of the expansion program that this company is understood to have in view.

A six-point advance in American Light & Traction was the most conspicuous change on the up side. Associated Gas & Electric improved to the extent of two and five-eighths points, while People's Gas, Light & Coke bettered its previous position by more than three points, in response to news of a capital increase giving stockholders the privilege to subscribe to 10 per cent additional stock at par. Subscription rights will be worth approximately $2. Proceeds of the sale will be employed to assist the company in handling its construction and expansion program for 1927.

In the outside market senior shares of Central Arizona Light & Power, Galveston-Houston Electric, North Texas Electric, El Paso Electric, Eastern Texas Electric and Electric Investors improved anywhere from two to five points.

North American Company Has Prosperous Year

The North American Company by the acquisition of new subsidiaries and investments in the bonds of other companies, aggregating about $11,000,000, has increased its reserves and surplus by $54,744,687 in the past twelve months. In the balance sheet as of June 30 reserves and surplus amounted to $130,467,969. The company made substantial expenditures for the subsidiaries acquired in the last part of 1925, with a resulting increase in their earnings.

The directors of the company on Aug. 23 declared the regular quarterly dividends of 1¾ per cent on the preferred stock and 2½ per cent on the common, both payable Oct. 1 to stock of record Sept. 7. The common dividend will be paid in common stock at the rate of one-fortieth of a share for each share held on Sept. 7.

The balance sheet of the company and its subsidiaries reports total assets of $647,293,033 as of June 30, against $387,654,269 a year ago, while current assets of $47,989,707 compare with $43,559,739 last year. Cash amounted to $21,094,742, comparing with $11,090,604.

Providence Merger Plan Condemned

Advisory Committee of Narragansett Stockholders Declares Proposal to Unite Lighting and Railway Properties Unnecessary, Unwise and Unsound

IN AN extended report presented last week to stockholders of the Narragansett Electric Lighting Company, Providence, R. I., an advisory committee headed by T. F. I. O'Donnell and including in its membership Samuel Ferguson, president of the Hartford Electric Light Company and of the Association of Edison Illuminating Companies, vigorously condemned the recently announced plan of Bodell & Company and other banking interests to merge the Narragansett company with the United Electric Railways, as outlined in late issues of the ELECTRICAL WORLD. The report sustained the recent adverse finding of the directors of the Narragansett company, and in a full-page advertisement setting forth the conclusions of the advisory committee President E. A. Barrows pointed out that the committee unanimously and unhesitatingly recommends that stockholders do not turn over their stock to the proponents of the proposed merger, stating that the price of $86 per share suggested for the Narragansett stock is totally inadequate. This accords with the published declaration of the directors that they believe the stock to be intrinsically worth much more than the price offered.

The committee regrets that the invitation extended to the proponents of the merger to give it the benefit of their views was declined. It points out that the rights of minority stockholders, should the plan go through, are amply protected by the laws of Rhode Island, and that in case of a sale resulting from the acquisition of control by the interests seeking it, the amount to be paid for minority shares will be fixed by the court. This price, the committee states, would not be less than $86 and would probably be considerably more. The committee seriously questions the legality of the plan. It points out that last year dividends and rights yielded $9 per share and that for the past twelve years, except for the four years of war, dividends and rights have averaged a return of $6.80 per share. The committee believes that the yield for the next ten years will be from $7 to $9 per year, estimating that the company will require about $37,000,000 for new plant in this period, the annual increase in energy consumption from residences alone in this territory being over 1,000,000 kw.-hr. The total savings estimated by the engineers retained to study the situation accruing from the merger and co-ordination of power plants are but $200,000 to $300,000 a year, an insignificant sum, the report states, in comparison with the increased interest and dividend requirements of the plan.

About 83 per cent of the stockholders are Narragansett customers. The annual dividends being paid by the Narragansett company (the Railways company not at this time paying any dividends) amount to $1,880,000. Under the proposed merger the interest and dividends which the plan contemplates shall be paid amount to more than $3,300,000, or an increase of over 75 per cent. The committee analyzes the plan at length and points out that these increased dividends and interest charges must come out of earnings and threaten rate reductions if they do not bring actual increases. The committee declares further than the plan means watering the present capitalization to the extent of $16,920,576 and that the plan is not in the interest of the Narragansett stockholders.

In a press statement on Friday J. J. Bodell of Bodell & Company, Providence bankers, said that no increase in rates is contemplated as a result of the merger. He declared that the price of $86 per share discounts the value of rights for many years to come and said that the stockholders should insist upon the committee's obtaining $150 to $350 per share for them, in view of the committee's reference to prices paid for control of many New England electric utilities during the past few years in contending that the $86 is an inadequate price.

June Revenue 14.4 per Cent Over Last Year

Reports received by the ELECTRICAL WORLD from central-station systems representing 80 per cent of the generator rating of the industry indicate that

the total gross revenue from the sale of energy during June was $132,700,000, or a daily average of $4,420,000, an increase of 14.4 per cent over June of last year. The gross revenue was 7.8 per cent above the estimated normal for that month, this normal being based on the operations for the past five years.

The operating expenses during June totaled $61,000,000, a gain of 11.1 per cent over June of last year.

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of July:

Name of Company	Gross Earnings for July 1926	1925
Alabama Power	$1,027,207	$999,067
Bangor Hydro-Electric	126,326	119,416
Central Illinois Light	303,318	271,957
Commonwealth Power	3,745,137	3,333,645
Consumers Power	1,847,925	1,560,500
Detroit Edison	785,955	736,721
Florida Power & Light	1,196,489	764,001
Idaho Power*	254,349	257,616
Illinois Power	170,539	166,150
Massachusetts Lighting	300,982	292,105
Ohio Edison	124,479	107,236
Southern California Edison	2,714,896	2,333,502
Southern Indiana Gas & Elec.	220,219	199,891
Tennessee Elec. Power	928,551	912,478
Utah Light & Power*	820,239	768,798

*June.

New Capital Issues

During the week ended Aug. 26 the National Power & Light Company made an offering of 100-year 6 per cent gold debentures, series A, involving a total of $9,500,000. These bonds were priced at 98 and interest, to yield over 6.10 per cent. Upon completion of present financing, they will be the only funded debt of the company. They will take precedence as to earnings and assets over both preferred and common stocks, which stocks now outstanding with the public have an aggregate value, based upon their present market quotations, of more than $60,000,000. The company owns all the outstanding common stock, except directors' shares, of the Birmingham Electric Company, Carolina Power & Light Company, Houston Lighting & Power Company, Jackson (Tenn.) Railway & Light Company, Knoxville Power & Light Company and Memphis Power & Light Company. The last-named company controls the Memphis Street Railway Company. Numbered among the more important communities served are Birmingham, Houston, Memphis, Knoxville, Jackson, Raleigh, Durham and Asheville. The company's subsidiaries, either directly or indirectly, supply public utility service in five states to 201 communities, including 199 served with electric power and light. The total population served is estimated to be in excess of 1,163,000. The Electric Bond & Share Company supervises the operations of the company and its subsidiaries.

Connecticut Utilities Report Increased Earnings.—Electric light companies of Connecticut showed increased combined earnings of $1,895,819 for the year 1925. Separate earnings were as follows: Bristol & Plainville Electric, $1,253,209; Connecticut Light & Power, $6,853,097; Connecticut Power, $2,529,300; Danbury & Bethel Gas & Electric, $890,324; Derby Gas & Electric, $1,293,778; Northern Connecticut Light & Power, $466,379; Putnam Light & Power, $318,868; Rockville-Willimantic Light, $558,444; Stamford Gas & Electric, $1,483,087; Torrington Electric Light, $506,170; United Illuminating, New Haven, $5,389,843; Meriden Electric Light, $645,596; Danielson & Plainfield Gas & Electric, Norwich, $436,624. The Hartford Electric Light Company showed a slight decrease. Total earnings amounted to $5,120,661, compared with $5,611,728 for the preceding year.

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 24	Low 1926	High 1926
ABITIBI PWR. & PAPER, com. —no par	88	70¼	88
Adirondack Pwr. & Lt.—7% pf.	108	....	....
Adirondack Pwr. & Lt.—8% pf.	112	....	....
Ala. Pwr., pf.	105½	....	....
Allis-Chalmers Mfg. pf.	k109¼	105	110¼
Allis-Chalmers Mfg., com.	88¼	78¼	94¼
Aluminum Co. of Amer., com.	69¼	54¼	76
Aluminum Co. of Amer. new, pf.	101	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	91	88¼	98
Amer. & Foreign Pwr., com.—no par	20	15½	42¾
Amer. Bosch Magneto, com—no par	20½	16	34¼
Amer. Brown, Boveri, Elec.	46	30½	50
Amer. Brown, Boveri, Elec., pf.	k 96¾	86¼	97¼
Amer. Elec. pwr., pf.	m111	102	111
Amer. Gas & Elec., 6% pf.—no par.	m94¾	90½	95¾
Amer. Gas & Elec., com.—no par.	96	64	99¼
Amer. Lt. & Trac., 6% pf.	107	105	115½
Amer. Lt. & Trac., com.	224½	195	263
Amer. Pwr. & Lt., 6% pf.	99	92	98¼
Amer. Pwr. & Lt., com.—no par	k 67	50¼	72
Amer. Pub. Serv., 7% pf.	c 97	92	99
Amer. Pub. Serv., com.	50	45	80
Amer. Pub. Utilities, 6% pf.	82	....	....
Amer. Pub. Utilities, 7% pf.	96	....	....
Amer. Pub. Utilities, com.	77	....	....
Amer. States Sec., A	3	....	....
Amer. States Sec. B	2½	....	....
Amer. Superpwr., pf.—25	25¼	23	26¾
Amer. Superpower, pf.	l 93	....	....
Amer. Superpwr., Class A—no par.	k 30¼	19½	37¾
Amer. Superpwr., Class B—no par.	30	21¼	39
Amer. Wtr. Wks. & Elec., 7% pf.	m104¼	101¼	108¼
Amer. Wtr. Wks. & Elec., com.—20.	57¼	43¼	74
Anaconda Copper	49¾	41¼	51¾
Appalachian Pwr., 7% pf.	98	99	101
Appalachian Pwr., 1st pf., 7%	98	99	102
Appalachian Pwr., com.	78	78	83
Arizona Pwr., 7% pf.	64	....	....
Arkansas Cent. Pwr., pf., $7—no par	m104	99	107
Arkansas Lt. & Pwr., 7% pf.	101	....	....
Arkansas Lt. & Pwr., com.	100	110	115
Asheville Pwr. & Lt., 7% pf.	l107	100½	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	84	....	....
Assoc. Gas & Elec., Class A—no par	37¼	25¼	38
BABCOCK & WILCOX, com.	119	117	151
Birmingham Elec. pf.—$7—no par.	103¾	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50	98	....	....
Blaw-Knox, com.	t 60½	45	63
Brazilian Trac., Lt. & Pwr., com.	f118	....	....
Broad River Pwr., pf.	93½	....	....
Brooklyn Edison, com.	151	133	159
Buffalo, Niagara&East.Pwr.,pf.—25.	l 25½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par	l 31¾	....	....
CALIFORNIA ELEC. GENERATING, pf.	92	89	95
California Ry. & Pwr., pf.	90	88	115
Carolina Pwr. & Lt., pf.—$7—no par	107½	104	107½
Cent. & S. W. Ut. 7% pf.—no par	a 92½	89½	96¼
Cent. & S. W. Ut., pr. In. pf.—no par	a 97¼	93	100
Central Ariz. Lt. & Pwr., pf.	104	....	....
Central Ark. Ry. & Lt., 7% pf.	k 98	99	99½
Central Ill. Pub. Serv., 6% pf.	a 88½	87	91
Central Ind. Pwr., 7% pf.	87½	85	93
Central Pwr. & Lt., pf.	97½	....	....
Central States Elec., 7% pf.	91	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	m115	110	116
Chicago Fuse Mfg., com., no par.	a 30½	30	35
Cincinnati Gas & Elec., com.	g 89½	88	95
Cities Service, 6% pf.	l 89½	86½	89½
Cities Service, pf.B—10	l 7½	7½	7½
Cities Service, pf. BB—100	l 77½	74	79
Cities Service, com.—20	l 44¼	37¼	44¼
Cities Service, Bks. Shrs.—10	l 22	19¼	22
Clarion River Pwr., pf.	93	93	95
Cleveland Elec. Illg., 6% pf.	105	....	....
Cleveland Elec. Illg., com.	295	....	....
Colorado Pwr., 7% pf.	95	96	97
Columbia Gas & Elec., 7% pf.	113¼	112	115½
Columbia Gas & E., com.—no par.	80¼	63½	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104½	....	....
Columbus Elec. & Pwr., com.	255	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	99	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93½	....	....
Col. Ry., Pwr. & Lt., com.—no par.	60	....	....
Commonwealth Edison, com.	a136½	135½	145
Commonwealth Pwr., 6% pf.	87½	82	88½
Commonwealth Pwr., com—no par.	40	28¼	42¼
Conn. Lt. & Pwr., 8% pf.	117	....	....
Conn. Lt. & Pwr., 7% pf.	109	....	....
Cons. Gas of N. Y., pf.—50	59½	....	....
Cons. Gas of N.Y., com.—no par.	106	87	115½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	e107	102	107½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	e111	108½	111½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e112½	109	113¾
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e127½	124	128¾
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	e 55	45	57½
Cons. Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	97½	....	....
Consumers Pwr., 6.6% pf.	103½	....	....
Continental Gas & Elec., 7% pfc. pf	101	....	....
Continental Gas & Elec., 7% pr. pf.	96½	....	....
Continental G.&E., com.—no par.	140	....	....
Croker Wheeler, com.	19	....	....
Croker Wheeler, pf.	54	....	....
DALLAS PWR. & LT., 7% pf.	105½	....	....
Dayton Pwr. & Lt., 6% pf.	99½	....	....
Detroit Edison, com.	135	123½	141½
Dubilier Condenser & Radio, com.—no par	7	4½	11
Dubuque Elec., 6% pf.	94	93	98½
Duquesne Lt., 7% pf.	k115½	111½	116½
EAST, N. Y. UTIL, pf.	102	80	104
Eastern New York Util., com.	65	70	75
Eastern States Power	16	....	....
Eastern States Power, pf.	87	....	....
Eastern Tex. Elec., 7% pf.	104	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com.	d229½	207	250
E. Paso Elec., com.—no par.	70	70	94
E. Paso Elec. pf.	104½	....	....
Elec. Bond & Share, 6% pf.	107	103½	109½
E. Bd. & Share Sec., com.—no par.	l 71	56½	86
El. Household Util.	a 15	13½	25
Elec. Investors, 6% pf.—no par.	93	....	....
Elec. Investors, com.—no par.	43	30½	74½
Elec. Investors, 10% pd. receipts.	20	12	56
Elec. Pwr. & Lt., ctfs. pf.	96½	89½	97¼
Elec. Pwr. & Lt., ctfs., 40% pd.	k103½	99½	115
Elec. Pwr. & Lt., ctfs. full pd.	m105½	....	....
Elec. Pwr. & Lt., ctfs., com—no par.	18½	15½	34½
Elec. Ry. Securities, com.—no par.	6	4½	10
Elec. Refrig.	64½	61½	78½
Elec. Storage Battery, com.—no par.	90½	71½	91½
Elmira Wtr., Lt. & R. R., 7% pf.	99	97½	99½
Emerson Elec., pf.	m101	100	104½
Empire Dist. Elec., 6% pf.	l 88	82	88
Empire Power, A.	23½	21	32
Engr. Pub. Serv., pf.—no par.	m 96	87	96
Engr. Pub. Serv., com.—no par.	m 24	24	29½
Eureka Vac. Cleaner, com.—no par.	k 52½	43	56
FAIRBANKS MORSE, pf.	k111	108½	115
Fairbanks Morse, com.—no par.	k 51	46	59½
Federal Lt. & Trac., com.	33	28	39½
Federal Light & Traction, pf.	m 88	86	89
Federal Utilities, pf.	70	....	....
Federal Utilities, com.	17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l107	105	108½
GALVESTON-HOUSTON ELEC., 6% pf.	53	....	....
Galveston-Hstn. El., com.	18	....	....
Gen. Elec., com.	90½	79	95½
Gen. Elec., special—10	11½	11	11½
Gen. G.&E., (Del.) com. A no par.	52	34	59
Gen. G.&E., (Del.) com. B no par.	45½	45	48¾
Gen. G.&E., (Del.) A pf. $8 no par.	108½	105½	110½
Gen. G.&E., (Del.) A pf. $7 no par.	97½	95	99¾
Gen. G.&E., (Del.) pf. B.	95	92½	96
General Public Service, pf.	m104	90	106½
General Public Service, com.	m12½	12½	16½
Ga. Lt., Pwr., & Rys., 6% pf.	94	82	96
Ga. Lt., Pwr. & Rys., com.	m70	70	72
Ga. Ry. & Power, 8% pf.	113	....	....
Ga. Ry. & Power, 7% pf.	104½	....	....
Ga. Ry. & Pwr., 4% pf.	k120	105	145
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h101	....	....
IDAHO PWR., 7% pf.	103½	103	104
Ill. No. Utilities, 6% pf.	a 91	90	92
Ill. Pwr. & Lt., 7% pf.	99½	....	....
Ingersoll Rand	96	80½	105
Int. Combus. Engr., com.—no par	55	33½	64½
Int. Utilities, class A—no par.	k 30½	31	39
Int. Utilities, class B—no par.	4½	4½	9¼
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	97	96½	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	94	....	....
Jersey Central Pwr. & Lt., pfc., pf.	110	110	112
Jersey Central Pwr. & Lt., com.—no par	45	45	50
Johns-Manville, com.—no par.	148	....	....

§Stock Exchange; aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, Aug. 14. lBid, low, high, Wednesday, Aug. 18. mLatest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 24	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	110¼	107¼	112½
Kansas Gas & Elec., 7% pf.	/103	99	103
Kentucky Hydro-Elec., pf.	a 95	91½	95½
Kentucky Sec., $6% pf.	80	..	....
Kentucky Sec., com.	100	....	....
Kentucky Utilities, 6% pf.	a 52½	49	52½
Keystone Pwr. & Lt. 7% pf.	96	95	97
LACLEDE GAS LT., com.	168	146	175½
Lehigh Pwr. Sec., com.—no par.	17½	10	23
Long Island Ltg., 7% pf.	107½	....	....
Long Island Ltg., com.—no par.	126	120	150
Los Angeles Gas & Elec., 6% pf.	97½	....	....
Louisville Gas & Elec., Class. A	24½	22½	26½
MANHATTAN ELEC. SUPPLY.	81½	56	87½
Manila Elec., com.—no par	k 33½	27½	39½
Maytag Mfg., com.	23¼	19	24½
Memphis Pwr. & Lt., pf., $7, no par	105	103	107
Metro. Edison, pf.—$6—no par.	93	....	....
Metropolitan Edison, pf., $7, no par.	103	....	....
Metropolitan Edison, com., no par.	45	45	50
Middle West Utilities, 7% pf.	a107	97½	111½
Middle West Utilities, 7% pr. lien pf.	a116½	106½	123½
Middle West Utilities, com.—no par.	113	108	134½
Midland Utilities, pr. ln. pf.	a102	98	104
Midland Utilities pf. A	a 99	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	98	100	102
Milwaukee Elec. Ry. & Lt., 6% pf.	91	87	88½
Minn. Pwr. & Lt., 7% pf.	/103½	100	104
Miss. Pwr. & Lt., pf.	104	....	....
Miss. River Pwr., 6% pf.	95	....	....
Miss. River Pwr., com.	60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	101	100	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	100	90	97
Mohawk Hudson Pwr., com.—no par	24	20½	28½
Montana Pwr., pf.	m117½	112½	119½
Montana Pwr., com.	79	69½	83½
Montreal Pwr., com.	/240	....	....
Mountain States Pwr. pf.	97	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	98	93	101
National Carbon, pf.	a127½	125	128
National Elec. Pwr., pf.	a 95½	92	96½
National Electric Pwr-A.	a 24½	19½	26½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	100	....	....
National Pwr. & Lt., com.—no par.	20½	16½	38½
National Pub. Serv., 7% pf.	92	....	....
National Pub. Serv., pte. pf.	110	....	....
National Pub. Serv., A com.—no par.	19½	15½	24
National Pub. Serv., B com.—no par.	15½	10	17½
Nebraska Pwr., 7% pf.	/106	103	107½
Nevada-Calif., Elec., com.	m 23½	18½	44½
New Brunswick Pwr., pf.	50	30	55
New England Pub. Serv., pr. ln. pf.	97	98	99½
New England Pub. Serv., pf.	88	89	90
N. J. Pwr. & Lt., 7% pf.	105	106	107
New Orleans Pub. Serv., 7% pf.	102	100	102
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	88	89	90½
N. Y. Central Elec., 7% pf.	98	98	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25.	k 28	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf.	109	110	111½
No. Amer., 6% pf.—50.	k 51½	49	51½
No. Amer., com.—10	54	42	67
No. Amer. Edison pf.—no par.	93	93	95
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd.	m 94½	89	96
No. American Utilities, pf., 25% pd.	m 19	18	27
N.C. Pub. Serv., pf.—$7—no par.	93	....	....
Northeastern Pwr., com.	18½	17½	36½
No. Indiana Gas & Elec., pf. A.	100	98	103
No. N. Y. Utilities, 7% pf.	104	....	....
No. Ohio Pwr., com.—no par	13½	12	23
No. Ohio Trac. & Lt., 6% pf.	80	78	81
No. Ohio Trac. & Lt., 7% pf.	94	88	96
No. Ont. Lt. & Pwr., pf.	82	78	84
No. Ont. Lt. & Pwr., com.	73	45	75
No. States Pwr., 7% pf.	101½	....	....
No. States Pwr. com.	105	97	136½
No. Texas Elec., 6% pf.	20	....	....
No. Texas Elec., com.	53	....	....
OHIO BRASS, com. B—no par.	74	70	79
Ohio Brass, pf.	101	98	101
Ohio Gas & Elec., 7% pf.	94	94½	95
Ohio Pwr., 6% pf.	94½	93	96
Ohio Pub. Serv., 6% pf.	l 94	90	96
Ohio Pub. Serv., 7% pf.	l 99	96	100
Ohio River Edison, pf.	101½	....	....
Oklahoma Gas & Elec., pf.	95	....	....
PACIFIC GAS & ELEC., 6% pf.	100½	....	....
Pacific Gas & Elec. com.	k130½	118	132½
Pacific Pwr. & Lt., 7% pf.	/102	98	102½
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt & Pwr., pf.—no par	c 72½	71	91
Penn-Ohio Edison, 7% pf.	95½	....	....
Penn-Ohio Elec., 7% pf.	94	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	96	96	97
Penn-Ohio Pwr. & Lt., 8% pf.	106	106	107
Penn Pwr. & Lt.—$7—no par.	/107½	103	108½
Penn Pub. Serv., 7% pf.	101	96	103
Penn Pub. Serv., 6% pf.	85	85	90
Penn Wtr. & Pwr., com.	c 155	141	171
Phila. Co., 6% pf.—50.	k 50	47½	51½
Phila. Co., com.—50.	k 74	59½	76½
Phila. Elec., com.—25.	c 50½	41½	67
Pittsburgh Utilities, pf.—10.	m 17	14½	20½
Portland Elec. Pwr., 7% pf.	100	....	....
Portland Elec. Pwr., 6% pf.	84	71	80
Portland Elec. Pwr., 6% 2nd pf.	72	71	75
Portland Elec. Pwr., com.	31	....	....
Potomac Elec. Pwr., pf.	/108½	....	....
Pwr. Corp. of N.Y., com—no par.	m 79	77½	90½
Pwr. Sec., pf.—no par.	10	10	29
Pwr. Sec., com.—no par.	4	4	13
Pub. Serv. of N. J., 7% pf.	106½	103½	109½
Pub. Serv. of N. J., 8% pf.	120	115	122
Pub. Serv. of N. J., com.—no par.	90½	72	93½
Pub. Serv. of No. Ill., 6% pf.	a103½	100½	106
Public Serv. of No. Ill., 7% pf.	a114	112	116½
Pub. Serv. of No. Ill., com.—no par	a134	128½	140
Pub. Serv. of No. Ill., com.	a134	129½	140
Pub. Serv. of Okla., 7% pf.	95	92	97
Pub. Serv. Elec. & Gas, 8% pf.	k102	97	104
Public Service Elec. Pwr., pf.	k113	106	114
Puget Sound Pwr. & Lt., 7% pf.	102	....	....
Puget Sound Pwr. & Lt., 6% pf.	82	....	....
Puget Sound Pwr., & Lt., com.	29	28	66½
RADIO CORP. OF AM., pf.—50	k 48½	44½	48½
Radio Corp. of Amer., com.—no par.	44½	32	48½
Republic Ry. & Lt., pf.	106	....	....
Republic Ry. & Lt., com.	82	....	....
Rochester Gas & Elec., 5% pf.	95	80	98
Rochester Gas & Elec., 6% pf.	101½	....	....
Rochester Gas & Elec., 7% pf.	104	105	107
SAN JOAQUIN LT. & PWR., 7% pf.	97	97½	98½
Safety Cable, com.	49½	42½	54½
St. Joseph Ry., Lt., Ht. & Pwr., pf.	67	60	70
Servel Corp.	17½	17½	22½
Sierra Pacific Elec., com.	27	....	....
Sioux City Gas & Elec., 7% pf.	98½	96	101
S. E. Pwr. & Lt., pf.—$7—no par.	l 99½	....	....
Southeastern Pwr. & Lt., ptc. pf.	l 66½	....	....
S. E. Pwr. & Lt. com.—no par.	29½	20	46½
So. Calif. Edison, 8% pf.—25.	32	32½	33½
So. Calif. Edison, 7% pf.—25.	27½	27½	28½
So. Calif. Edison, 6% pf.—25.	24½	24½	25½
So. Calif. Edison, com.	31½	30½	33
Southern Cities Utilities, 7% pf.	85	....	....
Southern Cities Utilities, com.	34	....	....
Southwestern Lt. & Pwr., A.	60	52	60
Southwestern Lt. & Pwr., B.	58	38	58
Southwestern Lt. & Pwr., $6 pf.	80	78	82
Southwestern Pwr. & Lt., 7% pf.	102½	100	105
Springfield (Mo.) Ry & Lt., 7% pf.	99	95	100
Standard Gas & Elec., 8% pf.	57	53½	57½
Standard Gas & Elec., 7% pf.	103	....	....
Standard Gas & Elec., com.—no par.	54½	51	69
Standard Pwr. & Lt., 7% pf.	95	....	....
Staten Island Edison, pf.—$6—no par	95½	....	....
Superheater, com.—no par.	157	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com.	335	260	345
TAMPA ELEC., com.	50	....	....
Tenn. Elec. Pwr., 6% pf.	89½	....	....
Tenn. Elec. Pwr., 7% pf.	102	....	....
Terre Haute, Ind. & East Trac., pf.	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	/106½	102	106½
Tide Water Pwr., 8% pf.	101	....	....
Timken Roller Bearing, com—no par	60	44½	62½
Toledo Edison, 8% pf.	/113	111	113
Toledo Edison, 7% pf.	/102½	101	103
Toledo Edison, com.	/102½	101	103
Tri-City Ry. & Lt., 6% pf.	86	87½	89
UNITED GAS & ELEC., 6% pf.	97	....	....
United Gas & Elec., com.—no par.	m 57	56	66
United Gas & Elec. (N.J.), 5% pf.	71	....	....
United Gas Impr.—50.	c111½	84½	144½
United Lt. & Pwr., pf.—$4—no par.	50	44	51
United L. & P. pf.—$6.50—no par.	87	81	91
United Lt. & Pwr., com., A—no par	a 16½	13½	26
United Lt. & Pwr., com., B—no par	a 19½	15	31
Utah Pwr. & Lt., 7% pf.	/102	99	103½
Utica Gas & Elec., 7% pf.	105	103	106
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A.	29	28½	37
Utilities Pwr. & Lt., com. B—no par.	13½	13½	18½
VERMONT HYDRO - ELEC., 7% pf.	95	95½	96
Virginia Elec. & Pwr., 7% pf.	104	101	105
Virginia Pwr., 7% pf.	108	102	104
Virginian Pwr., com.	70	65	75
WAGNER ELEC., pf.	m 68	61½	85
Wagner Elec., com.—no par.	b 17	13½	34½
Washington Ry. & Elec., com.	/196	....	....
Washington Ry. & Elec., pf.	j 89½	....	....
Washington Wtr. Pwr., com.	133	130	136
West Mo. Pwr., 7% pf.	93	....	....
West Penn., 7% pf., temp. ctfs.	m100	95½	101
West Penn, com.	m125	118	130
West Penn. Elec., pf.	k 98	95½	100½
West Penn Elec., Class A.	k 96	88½	97
West Penn Pwr., pf.	k111	108	112
West Va. Lt., Ht. & Pwr., 7% pf.	94½	95	98
West Va. Utilities, 7% pf.—50.	45	43	48
Western Pwr., 7% pf.	94	89	93
Western States Gas & Elec., 7% pf.	96	89	93
Western States Cas & Elec., com.	16	....	....
Westinghouse El. & Mfg., com—50.	68½	65	79½
Weston Elec. Instrument, Class A.	k 31½	27½	32½
Weston Elec. Instrument, com.	17½	13½	19½
Wheeling Elec., pf.	94	91	97
Wis. Pwr., Lt. & Ht., 7% pf	90	85	90
Worthington Pump, pf. A.	k 70	66	80
Worthington Pump, pf. B.	k 55	53	65
Worthington Pump, com.	k 26	20½	44½
YADKIN RIVER PWR., 7% pf.	/107	102	107½
Yale & Towne, com.—25.	68½	60½	69

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Saturday, Aug. 14. lBid, low, high, Wednesday, Aug. 18. mLatest quotations available.

Indiana Service Corporation 6 per Cent Preferred Stock Offered.—The second public offering of 6 per cent preferred stock by a subsidiary of the Midland Utilities Company of Indiana has been made. A new issue, with a par value of $700,000, of 6 per cent preferred stock of the Indiana Service Corporation, one of the operating subsidiaries in the Midland group, is offered to investors by the Utility Securities at $92.50 a share, to yield about 6.50 per cent. The last preferred stock of the company was a 7 per cent issue and was sold on the basis of a fraction above the 7 per cent yield. The new 6 per cent preferred is on a parity in all respects with the 7 per cent of the company except as to the annual dividend rate and the callable price. Seven per cent stock with a par value of $2,050,000 now is outstanding. The Midland, which is an investment company controlling through stock ownership public utility companies operating chiefly in northern Indiana and western Ohio, was organized a little more than three years ago. The company acquired controlling interest of the Indiana Service Corporation a little more than a year ago.

Staten Island Edison Stock Offer.—Pursuant to the offer of Staten Island Edison Corporation, one of the companies of the Associated Gas & Electric System, extending to holders of its common stock of record at the close of business on July 26, 1926, the privilege of subscribing at the price of $60 per share for additional shares of its common stock at the rate of 53/118ths share of additional common stock for each share of common held of record on that date, the corporation has addressed a letter to the holders of voting-trust certificates under the voting-trust agreement dated Aug. 1, 1923, for common stock of the Staten Island Edison Corporation, wherein such holders are given the privilege of exercising similar rights through the voting trustees with respect to shares held for their benefit. Proceeds of subscriptions are to be used for the redemption of the $7 dividend series convertible preferred stock and the $6.50 series convertible preferred stock of the Staten Island Edison Corporation, pursuant to a recent order of the Public Service Commission.

Commonwealth Power Corporation Reports Earnings.—Earnings of the Commonwealth Power Corporation and subsidiaries for the twelve months ended July 31, 1926, applicable to dividends and retirement reserve amounted to $9,615,376, or $26.24 per share on the outstanding 366,378 shares of preferred stock and $6.51 per share on the 1,138,922 shares of common stock. After provision for retirement reserve, earnings amounted to $17.35 per share on the preferred and $3.65 per share on the common as compared with $12.26

and $2.03 respectively for the same period last year, based on the same number of shares now outstanding.

Southwestern Gas & Electric Changes Set-up.—Stockholders of the Southwestern Gas & Electric Company have increased the authorized capital stock from $8,500,000 to $16,000,000, divided as follows: Common stock, 75,000 shares; 7 per cent preferred stock, 75,000; 8 per cent preferred, 10,000 shares.

Adirondack Power Corporation Earned $1,283,170 in Year.—The Adirondack Power & Light Corporation has issued its pamphlet report for the year ended Dec. 31, 1925, showing net income of $1,283,170 after depreciation, taxes, interest, etc., equivalent after preferred dividends to $2.26 a share (par $50) earned on 186,226 shares of common stock. The consolidated income account for the year ended Dec. 31, 1925, follows:

Gross	$8,287,165
Expenses, taxes and depreciation	5,265,803
Net	$3,021,362
Other income	63,407
Total income	$3,084,769
Interest, etc.	1,801,599
Net income	$1,283,170
Preferred dividends	861,272
Surplus	$421,898

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Associated Gas & Elec., orig. pf.	0.87½	Oct. 1
Assoc'ted Gas & Elec., orig. pf. (ex.)	.12½	Oct. 1
Associated Gas & Elec., 7% pf.	1.75	Oct. 1
Buffalo, Niagara & East'n Pr., com.	.25	.....
Conecticut Power, com.	2½	Sept. 1
Connecticut Power, pf.	1¾	Sept. 1
Con. Gas, Elec. Light & Pwr., com.	.62½	Oct. 1
Con. Gas, Elec. Light & Pwr., pf. A.	2	Oct. 1
Con. Gas, Elec. Light & Pwr., pf. B.	1¾	Oct. 1
Con. Gas, Elec. Light & Pwr., pf. C.	1¾	Oct. 1
Con. Gas, Elec. Light & Pwr., pf. D.	1¾	Oct. 1
Galveston-Houston Elec., pf.	3	Sept. 15
Georgia Railway & Power, com.	1	Sept. 1
Kansas City Pwr. & Lt., 1st pf. A.	1.75	Oct. 1
New England Telep. & Teleg.	2	Sept. 30
Niagara Falls Power, com.	.50	Sept. 30
Niagara Falls Power, pf.	.43¾	Oct. 15
Niagara, Lockport & Ont. Pwr., com.	.50	Sept. 30
Niagara, Lockport & Ont. Pwr., pf.	1¾	Oct. 1
North American, pf.	1¾	Oct. 1
North American, com.	2½	Oct. 1
North Amer. Util. Securities, 1st pf.	1.50	Sept. 15
North American Utilities Securities 1st pf. allot. ctfs.	1.50	Sept. 15
Northern Texas Elec., pf.	3	Sept. 1
Northwestern Pub. Serv., pf.	1¾	Sept. 1
Rochester Gas & Elec., pf. B.	1¾	Sept. 1
Rochester Gas & Elec., pf. C.	1¾	Sept. 1
Rochester Gas & Elec., pf. D.	1¾	Sept. 1
Southern California Edison, pf. A.	.43¾	Sept. 15
Southern California Edison, pf. B.	.37½	Sept. 15
Southern Cities Utilities, pf.	.58¾	Sept. 10
Southern Gas & Power	.43¾	Sept. 15
Standard Gas & Elec., pf.	2	Sept. 15
United Gas & Elec.	1.00	Sept. 10
Vesta Battery, pf.	1¾	Sept. 1
Wisconsin Pub. Serv., 7% pf.	1¾	Sept. 1
Wisconsin Pub. Serv., 6½% pf. No. 1	1¾	Sept. 20

Central Power & Light's Structure

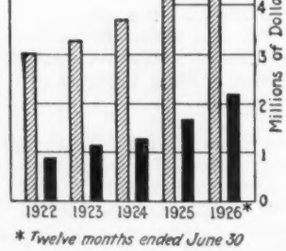
This Insull Property Operating in Southern Texas Shows Annual Gross Earnings of $5,811,375 and Is Earning Bond Interest Three Times

By PAUL WILLARD GARRETT
Financial Editor *New York Evening Post*

THE Central Power & Light Company, which was organized as a Massachusetts corporation in 1916, now supplies public utility service to a centralized group of 92 communities in the southern part of Texas. Electric light and power is supplied to 86 of the communities, ice to 67, water to sixteen, gas to three and street-railway service to two. Operations of the company are controlled by the Central & South West Utilities Company, which is a subsidiary of the Middle West Utilities Company. Martin J. Insull is president.

The issue of first mortgage 5 per cent bonds due in 1956, amounting to $14,500,000, that recently was marketed at 96, or on a basis to yield 5.25 per cent to maturity, represents the only funded debt of the company. The bonds are followed by $7,015,000 of 7 per cent cumulative preferred stock and by 81,430 shares of common stock. The company's new financing has greatly improved its position, since through the flotation of bonds that bear a 5 per cent coupon the management has been able to arrange for the redemption of bonds that bore a 6½ per cent coupon.

It is reckoned that on completion of the company's new financing annual interest requirements on the entire funded debt will amount to $725,000. Gross earnings of the Central Power & Light Company and its subsidiaries for the twelve months ended June 30, 1926, were $5,811,375, from which $3,610,729 was deducted for operations, rentals, taxes and maintenance, leaving net earnings of $2,200,645. In other words, net earnings for the twelve months ended June 30, 1926, were enough to cover annual interest charges on bonds presently to be outstanding more than three times.



GROWTH OF EARNINGS IN FIVE-YEAR PERIOD

One interesting feature of the new issue is that the company agrees to reimburse the resident holders of the bonds, if requested within 60 days after payment, in the manner provided in the mortgage, for the personal property tax of the State of Connecticut, Pennsylvania and California not exceeding 4 mills per annum, the Maryland tax not exceeding 4½ mills per annum, the District of Columbia tax not exceeding 5 mills per annum and for the Massachusetts income tax on the interest of bonds not exceeding 6 per cent of such interest per annum.

As a maintenance and renewal fund the Central Power & Light Company's first mortgage provides that during each calendar year the company will expend an amount not less than 12½ per cent of the sum of the gross earnings derived from operation of its mortgaged properties for (a) the making of repairs, renewals and replacements; (b) the making of extensions or the acquisition of properties on account of which the company would otherwise be entitled to issue additional bonds, or (c) the redemption or the purchase and cancellation of any bonds issued under the mortgage. The mortgage is an open-end lien, but provisions are set up to protect investors against the issuance of bonds in amounts dangerous to the position of those already outstanding.

New Members on Southern Cities Board.—Marshall Forrest and W. B. Clift, of Ames, Emerich & Company, have been elected directors of the Southern Cities Utilities Company.

Weston Electrical Income Advances.—The Weston Electrical Instrument Company for the first half of 1926 reports a net income of $405,501 after depreciation, federal taxes, etc., against $342,112 in the similar period of 1925. For the June quarter profit was $190,142 as against $215,359 in the preceding quarter and $177,048 in the second quarter of 1925.

Northern Indiana Public Service Issuing Bonds in the Amount of $15,500,000.—The Indiana Public Service Commission has issued an order approving requests by the Northern Indiana Public Service Company, an Insull corporation, for permission to issue and sell bonds totaling $15,500,000 for refunding purposes and to meet future and past capital expenditures and additions.

National Power & Light to Redeem Bonds.—The National Power & Light Company will redeem on Sept. 1, 1926, its entire issue of 50-year 7 per cent income bonds at 105 per cent plus the two months' unpaid interest from July 1 to Sept. 1. There is now outstanding $8,417,100 of the income bonds. They were issued in 1922 and do not mature until 1972. In connection with the redemption of the income bonds, the company has issued $9,500,000 6 per cent gold debentures, series A, to bear interest from Aug. 1, 1926, and to mature Aug. 1, 2026. Holders of the income bonds will have the opportunity to exchange the same for debentures, bond for bond, and receive cash equal to the difference between the call price of the income bonds so exchanged and 98 and accrued interest to Sept. 1 for the debentures received in the exchange. There will be a public offering of the remaining debentures at not less than 98 and accrued interest.

Manufacturing and Markets

L. K. Comstock Receives McGraw Award

Second Contractor-Dealer Medal Presented for Promoting a Better Understanding Between the Electrical Construction Industry and the Labor It Employs

THE second annual presentation of the contractor-dealer medal and purse given under the James H. McGraw award was a feature of the opening session of the convention of the Association of Electragists International on Wednesday morning, Aug. 25, at Cedar Point, Ohio. The bronze medal with the purse of $100 in gold was awarded to Louis K. Comstock, and certificates of honorable mention were extended to Arthur L. Abbott, Charles F. James and G. Fred Laube, with the following citations:

"LOUIS K. COMSTOCK, chairman of the board of directors of L. K. Comstock & Company, New York, for years has believed that the vital interests of the public and of employer and employee in industry are inseparably bound together and that all benefit by a continuous peaceful operation of the industrial process. To this end he has devoted himself with persistent purpose to the promotion of a better understanding between the electrical construction industry and the labor it employs. Beginning, on his initiative, by the appointment of a committee by the Conference Club in 1918, a 'joint declaration of principles' was adopted in 1919 by the National Association of Electrical Contractors and Dealers and by the International Brotherhood of Electrical Workers, and in 1920 'the Council on Industrial Relations for the Electrical Construction Industry of the United States and Canada,' consisting of five representatives of the employees and five representatives of labor, was organized, with Mr. Comstock as chairman. This council functions not merely as a board of arbitration in labor disputes, but as a court of justice, giving its decisions not by compromise but through the application of definite and certain principles, and it has assisted in the conciliation and adjustment of many cases submitted from all sections of the country, with the result that for two years there have been no strikes in the electrical construction industry.

"Mr. Comstock has been the inspiration and the sustaining strength of this work since its inception. He has brought to the council a practical idealism, a breadth of vision and an unselfish devotion to a public service seldom seen in the affairs of any industry. Without regard to the sacrifice of time or energy, he has given to this work a personal leadership that has raised the council to a high place in the respect and confidence of electrical men. In recognition of this distinguished contribution to the advancement of the contractor-dealer branch of the electrical industry the judges have awarded to Mr. Comstock the contractor-dealer medal and purse for 1926, given under the James H. McGraw Award."

"ARTHUR L. ABBOTT, technical director Association of Electragists International, New York, while manager of the Electric Construction Company of St. Paul in 1907, and later, until 1923, as vice-president of that concern, reorganized as the Commonwealth Electric

L. K. COMSTOCK

Company, became convinced of the need for authoritative estimating cost data, covering broad and comprehensive surveys of labor costs on electrical construction work, prepared in a simple and universally adaptable form which may be readily comprehended and applied by every electrical contractor to fit every type of job and job condition which the contractor must estimate. In 1919 he took the initiative and was largely responsible for the organization of a cost data committee in the National Association of Electrical Contractors and Dealers, serving on the committee first as a member and then as chairman. Through his able leadership and exhaustive personal work, the first 'Manual of Estimating' was published in 1922.

"In 1924 Mr. Abbott joined the staff of the Association of Electragists as its technical director, and since that time he has continuously studied and developed this manual of estimating, broadening its scope and enlarging its usefulness until it has become the accepted standard of the industry and is exerting a far-reaching influence on the cost knowledge and the prosperity of the electrical contractor. Meanwhile, in 1925 Mr. Abbott also conceived and developed the idea of the so-called local 'estimating schools,' through which electrical contractors in any community may study the art of estimating under the direction of trained leaders.

"In recognition of this constructive contribution to the advancement of the contractor-dealer branch of the electrical industry, the judges have extended to Mr. Abbott a certificate of honorable mention, given under the James H. McGraw Award for 1926."

"CHARLES E. JAMES, president Lektric Shop, Fort Pierce, Fla., as a result of his personal experience in resuscitating his own business with remarkable and well-deserved success through the introduction of an adequate accounting system, whereby he acquired a thorough and intimate knowledge of operations and results, became inspired with a zeal to help other contractors and dealers to benefit by a similar application of sound business principles. By the most untiring and unselfish devotion of his time and strength, he has worked to raise the contractor-dealer industry of his state to a higher ethical and economic plane, and through his able leadership and the respect and affection which he has won among them, he has given personal help to many contractors and dealers throughout the state, developed a strong and influential Florida Association of Electragists, with nearly 200 members in forty towns and cities, initiated and pushed forward sound state legislation for the electrical contractors, effected a closer understanding and sympathy between contractors and inspection interests and brought about a high degree of mutual respect between his branch of the industry and the jobbers, manufacturers and central stations. In recognition of this constructive contribution to the advancement of the contractor-dealer branch of the electrical industry, the judges have extended to Mr. James a certificate of honorable mention, given under the James H. McGraw Award for 1926."

"G. FRED LAUBE, president Laube Electric Company of Rochester, N. Y., believing that there is a considerable element of nuisance involved in the high-pressure door-to-door canvassing method of selling electrical appliances, which he feels affects the good reputation of all the local appliance merchants, initiated in his store a method of merchandising in which he relied upon excellence of display and a thoroughly organized program for the education of prospects and customers. Establishing what he calls an 'electrical department store' in which the display of associated lines is very carefully studied, he has succeeded in bringing to his store by invitation successive groups of women for the inspection of specific appliances and instruction in their use, without obligation or influence to buy. At the same time, by displaying together with standard lines and in direct comparison, the low-priced appliances commonly featured in drug and department stores, he has made a frank constructive demonstration of quality, and while offering the full range of prices, has greatly increased the popular preference for better goods. This method happily has proved profitable,

has resulted in raising the dignity of electrical appliance selling in Rochester and has benefited all local dealers. In recognition of the principles involved in this constructive contribution to the advancement of the contractor-dealer branch of the electrical industry, the judges have extended to Mr. Laube a certificate of honorable mention, given under the James H. McGraw Award for 1926."

PURPOSE OF AWARDS

The James H. McGraw award was established last year by Mr. McGraw "to encourage constructive thinking for the advancement of the electrical industry." Its permanence has been secured by an endowment given into the keeping of the Society for Electrical Development. Each year four bronze medals are awarded, each accompanied by a purse, to those men who are judged to have done most for the advancement of the manufacturing, jobbing or contractor-dealer branches of the industry or to promote co-operation between any two or more branches of the industry. The judges appointed this year by the Association of Electragists to make the contractor-dealer award were C. C. Bohn, J. C. Hatzel, W. Creighton Peet and George Weiderman. The presentation was made by Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, in behalf of the committee.

Why Tolerate These Electric Leagues?

About 140 Now Organized—They Promote a Better Understanding by the Public of the Application of Electrical Energy in the Home and in the Industry

BY DAVID C. BIRDSELL
Decorative Lamp & Shade Company

RECENTLY an official of one of our largest manufacturing companies remarked that he hated to waste his time attending meetings and serving on a committee of a local electrical league, but, of course, he had to do it, because the central-station company was interested in the league and he secured a large proportion of his business from that company. A central-station commercial manager in another community, when asked if there was a local league organized in his city, replied they "had one off and on, but, thank heaven, none existed at the present time." However, he supposed they would soon be pestered by the formation of another one. Such is the spirit of intolerance frequently displayed by leaders of the industry. Then why tolerate these pestiferous organizations?

It is quite evident from the remarkable and natural growth of these leagues—there are now some 140 organized—that they will have to be tolerated, whether liked or not. Under this spirit of antagonism many leagues have been crushed, but invariably they rise again in stronger and more permanent form. The mortality is great—but the birth rate is far in excess of the death rate.

REASONS FOR THESE ORGANIZATIONS

Just why are these organizations formed? First, because of the natural desire of the men in our industry to associate more closely with each other. It is conceded that the very nature of the electrical business has gathered into its personnel a broad and progressive type of worker. These men are in many branches of endeavor that go to make up the electrical fraternity, and many of these divisions are complements to some other parts of the trade, so that one man is a necessity to another. Hence it is most natural that they should desire close association. Leagues formed under this class are usually luncheon clubs. The cynic remarks: "Why join that crowd? They just organize to eat; they do nothing worth while." That is a big mistake. These men are certainly laying a solid foundation for future development along the lines of co-operative effort to develop business. They are promoting confidence, harmony and trustfulness, which will surely result, eventually, in unselfish effort for the benefit of our industry as a whole.

Sometimes local associations are formed to meet some special need in the community. Perhaps there are many old homes to be wired, or maybe the promotion of a new service, like refrigeration, makes it economically expedient for a combination of interests to carry a message to the public. If well managed, the success of this work results in the permanent formation of a league to promote better business, and here we find an organization composed in whole or largely by companies. The danger here lies in the neglect of social features which surely assist in welding more closely the interest in the organization.

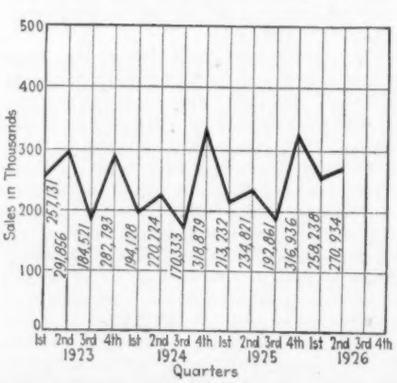
Unfortunately, too many local leagues are founded because of this very intolerance. Lack of understanding by the larger interests of the problems that beset other branches of the industry, lack of appreciation of the benefits to be derived from the respect that can be promoted by close association, selfish self-interest that results in oppressive tactics, all too frequently tend toward an association for protection and protest against real or fancied grievances. Such leagues build on a poor foundation—but better to be formed in a spirit of combat than not at all. A few such organizations develop into strong leagues and have materially assisted in breaking down prejudice and intolerance, but more generally they have failed, to be succeeded by a league indorsed and supported by the very interests they originally sought to fight, but who have been forced by necessity to investigate and learn the many benefits to be derived from a closer understanding of the other fellow's problems.

What are these leagues doing and where are they going? Today they are primarily cementing a spirit of good fellowship within their own local sphere that is strengthening their efforts to promote a better understanding by the public of the application of electrical energy in the home and in the industry. It is impossible to enumerate the many successful efforts by the leagues to promote interest in the products of our industry, but a little time spent in investigation will probably reveal results obtained that will show that whether self-interest lies in the central-station company, or whether one is a manufacturer, a distributor or a contractor-dealer, here is an army forming that will fight for and with the individual to secure better and more business at a minimum of expense and effort.

Any one too big to take part in this great forward movement of the industry, is certainly too small to impede its progress. Intolerance will promote resentment and really assist in forming the very organization condemned. How much better to promote progress along lines that throttle antagonism and to derive the benefit and satisfaction of working for the industry as well as in it!

The local league in each community needs the support of individuals, and any one having the gift of leadership can do a great work and command great respect. No matter how large an individual may loom in the industry and no matter how uninformed, no matter how intolerant, the day is fast approaching when he will be forced to recognize the existence of a natural, rapid growth of co-operation to promote the industry through the medium of the local electrical league. This movement will develop despite intolerance from some quarters, but it will prosper with assistance and so will the individual who assists.

Vacuum Cleaner Sales



Vacuum-cleaner sales by quarters during 1923, 1924 and 1925 and the first half of 1926. (Data supplied by Vacuum Cleaner Manufacturers' Association.)

Business Outlook Sound Says Gerard Swope

GERARD SWOPE, president General Electric Company, in speaking before the Association of Electragists International this week at their annual convention, held at Cedar Point, Ohio, commented on the business situation as follows: "The kilowatt-hours of

electrical energy generated throughout the United States has increased this year some 12 per cent. General business has also shown an increase in the first six or seven months of this year as compared with the same period last year, and apparently there is no cloud on the horizon to dampen our enthusiasm. The business outlook is sound, and we may look forward to increasing sales. This is true generally, and is particularly true of the electrical industry because new uses are being found for electrical apparatus in the home and workshop."

Commenting on the report of W. Creighton Peet at the convention, Mr. Swope pointed out that of the $1,420,000,000 worth of electrical manufacturing production, only 22 per cent was contributed by the General Electric Company and only 33 per cent by the General Electric and Westinghouse companies combined. Mr. Swope said that he knew of no industry more widely distributed among manufacturers, and that this meant greater competition and greater effort on the part of each company to do a better job for the public.

Business Conditions

REMARKABLY steady movement continues to characterize the electrical business. Central-station companies are not very active buyers in some sections, but the aggregate business is good and the industry is looking forward to satisfactory equipment purchases during the rest of the year. An order was placed by a utility company for a 15,000-kw. turbo-generator with condenser, switching equipment and stokers at a cost of approximately $400,000. It is expected that in the very near future an order will be placed by a Middle Western utility company for two extremely large turbo-generator units. Buying by industrial plants continues to hold up well, and manufacturers report that inquiries received indicate no decrease in that business. Representative of steadily increasing sales is the statement of a prominent jobber that his business is averaging a 20 per cent increase over last year.

In New England steady buying features trade, although no very large orders are reported. Negotiations for industrial equipment, rather than actual sales at present, are attracting the attention of manufacturers. Industrial electric heating sales are also promising in view of the heavy volume of inquiries being received. Central-station companies are inactive in the New York district, but manufacturers are optimistic as to purchases from those companies for the rest of the year. Sales to industrial concerns continue in good volume. In the Southeast sales are excellent for this period of the year. Good crops in the section are adding to the general feeling of optimism. The demand for line materials continues unabated. Two equipment orders placed include one for $50,000 worth of 110,000-volt oil circuit breakers and one for $17,000 worth of 50,000-volt switches. Sales in the Middle West are in good volume, and utility companies are busy with construction work. Orders placed include one for 22,000 ft. of 1,250,000 circ.-mil, 10,000-volt paper-insulated lead-covered cable.

On the Pacific Coast good machinery orders are reported, and despite unstable conditons in the lumber market and suspension of activites in logging camps, coupled with a normally slack season, there is a fair volume of industrial business with more in prospect.

Metal Market Weaker—Lead Quiet But Firm

The non-ferrous metal markets generally have weakened, and London prices have receded except those for tin and silver. Copper in large tonnages was sold in Connecticut at 14¼ cents delivered on Wednesday. In most quarters quietness is looked for until the end of the month, when more active buying for fourth-quarter requirements is anticipated. At least three of the large producers are virtually out of the copper market, their asking prices being materially above the figures at which business has been done. The demand has been light, and those who desire to sell have found it necessary to cut prices to attract buyers.

Further declines in the London market have made consumers of lead think that prices might decline here also, and as a result a smaller volume of orders has been placed than for some time. So far, however, no change has been made in the contract price of the American Smelting & Refining Company, which continues at 8.90 cents, New York, nor does there seem to be any reduction contemplated unless the London price falls to such an extent that foreign bullion lead can be imported at a profit. Producers are so bare of stocks that they are not worrying about a temporary let-up in demand; they expect buyers to enter the market again early next month, as it appears that a large amount of September lead still remains to be purchased. Rumors have been current of a 100-ton parcel of lead that was looking for a buyer at concessions from the smelting company's price, but if any lead was sold at a lower figure the amount was insignificant compared with that at the fixed price. A moderate business has been done in zinc with galvanizers the leading buyers. Prices have declined somewhat during the week. A mild demand for prompt deliveries of tin was evident early this week and has prevented the price from declining as supplies are very scarce.

NEW YORK METAL MARKET PRICES

	Aug. 18, 1926 Cents per Pound	Aug. 25, 1926 Cents per Pound
Copper electrolytic	14.525	14.275
Lead, Am. S. & R. price	8.90	8.90
Antimony	16¼	15¼
Nickel, ingot	35	35
Zinc spots	7.75	7.70
Tin, Straits	64.75	65¼
Aluminum, 99 per cent	27½	27½

Base copper price Aug. 25, 1926, 16¼ cents.

Utilities Inactive, but Outlook Good in New York District

A general inactivity in central-station buying is prevalent in the New York district. Nevertheless, there is a decidedly optimistic tone in reports from manufacturers, and it is generally believed that the present depression is merely seasonal and that the outlook for the next quarter is very promising. An order has just been placed for a 15,000-kw. turbo-generator with condenser, switching equipment and stoker amounting to about $400,000. Another company is known to be planning the purchase of a large turbo-generator unit. Some local sales of substation apparatus are also reported, together with some inquiries for switching equipments, although no orders of any significance are evident in this line. The demand for transformers, circuit breakers, pole-line hardware, etc., is dull at present. In the industrial field a sharp decline in sales of motors was noticeable by one manufacturer during the past week. A partial recovery from this condition, however, is reported already in evidence. Another manufacturer states that he has noticed no decline in this business. The demand for control apparatus is steady, 3-hp. and 5-hp. equipments especially showing excellent strength. The jobbers' market is spotty, having weakened considerably in almost all lines during the past week.

Good Machinery Orders Noted on the Pacific Coast

Good machinery orders are reported on the Pacific Coast and include such items as twelve 15-kva. distribution transformers for the Hawaiian Islands, $25,000 worth of automatic switching equipment for an extension to power service in the Delta district and $100,000 worth of electrical railway equipment for fifteen new municipal cars for San Francisco. The sale of three carloads of electric ranges, mainly for East Bay and San Joaquin Valley distribution, and three large baking ovens for a hotel in Honolulu are also reported. Fan sales in San Francisco and adjoining territory are exceptionally heavy for so late in the season, orders totaling 1,500 having been recently placed, largely for the 10-in. oscillating size, which are for sale in Sacramento and Fresno. Good business has been received from Nevada and include such items as 15,000 lb. of No. 12 bare copper wire for a telephone company, together with much line material, and 25 electric ranges for the Carson City district. Plans of the Truckee River Power Company to extend its lines to Lake Tahoe and as far as Meeks Bay are expected to result in increased sales in that territory. Miscellaneous large orders for the week include three carloads of fiber conduit, 3-in. and 4-in.

sizes, 110 assorted clamps and grips, 5,000 ft. No. 1/0 park cable for Fresno Street, and a main switchboard and panelboards amounting to $3,500 for a San Francisco skyscraper.

Despite unstable conditions in the lumber market and suspension of activities in logging camps, coupled with a normally slack season, jobbers in the Seattle district report a fair volume of industrial business with more in prospect. A pulp mill at Edmonds has purchased three 100-kva. transformers and two 1,250-hp. motors, with other equipment, involving an expenditure of $20,000. Ten thousand dollars' worth of wire was also purchased by a lumber mill at Lewiston, Idaho. The city of Seattle has awarded contracts for approximately $20,000 worth of copper wire and $50,000 worth of incandescent lamps. The city of Tacoma plans to issue specifications within 30 days for a 2,100-kva. substation and distribution system at Gig Harbor, to cost $125,000. A steel mill at Everett is expected to be in the market shortly for an electric furnace that will cost about $15,000, and a lumber mill north of Everett will shortly request quotations for approximately 100 motors totaling about 2,000 hp., while a mill near Seattle is expected soon to purchase about 500 hp. in motors.

Steady Buying Characterizes Trade in New England District

Buying throughout the New England district continues steadily but without any large orders. Small motor sales are spotty, one manufacturer reporting a slight slump during the past week, while another records a sales turnover considerably above the average and in excess of that reported for the corresponding week of last year. Central-station supplies are in fair demand, and transformer sales are active. Poles, insulators and cross-arms are moving in small lots. Construction work on transmission lines and substations is well along and attention is being turned to future projects. New line extensions are being planned for eastern New Hampshire, and plans for carrying out a large extension of service within the Boston district are maturing.

Negotiations for industrial equipment, rather than actual sales, are attracting the attention of manufacturers. Interest in waterwheel generators is quite active and announcement of a number of awards is expected soon. Turbo-generators are being considered in a number of plants within this area. Industrial electric heating sales are also promising in view of the heavy volume of inquiries being received. Electric trucks of the industrial type have been in good demand, and while at the present some inactivity is manifest, one manufacturer reports a volume of sales well above that recorded for last year. Household appliance sales are spotty, though the past week's showing of one group of central-station companies is encouraging. This group reports total sales above $14,500, which is 16 per cent above those for the corresponding week in 1925. Electric range sales are reported to have reached a high peak in this district, with summer resort buyers ranking first in the demand. Electric refrigeration is active, with sales in Maine showing a particularly high volume. New construction demands are heavy, and wire, cable and socket devices are selling well. This trend, it appears, will last for some little time as the contract volume reported weekly continues to maintain an exceptionally high level.

Sales in Middle West in Good Volume

Evidence of good business is apparent throughout all sections of the Middle West. The volume is holding up well, as indicated by record car loadings and good reports from industrial plants. Agricultural implement manufacturers are busy, and although steel production declined somewhat, optimism is present everywhere. Building activity apparently is continuing at its previous high level and everything points to a satisfactory month. The various utility companies are busy extending service lines and many small construction jobs are being started, although the number is not quite so high as earlier in the summer. An interesting order for 22,000 ft. of 1,250,000-circ. mil, 10,000-volt paper-insulated lead-covered cable was placed this week, while innumerable smaller orders for oil switches, circuit breakers, copper bus bar, meters, etc., contribute materially to the general volume of business. Maintenance purchases are unusually large. There has been a good demand noted for small motors, pole-line hardware and bus-type insulators. Cable manufacturers are still working at capacity, with deliveries running from five to eight weeks.

Jobbers' sales remain generally good. While the volume of business is not exceptionally large, business is steady with a varied demand for most commodities. Appliances continue to move well, electric flatirons remaining in the lead. Hotel and heavy-duty appliance sales are substantially good, with a remarkably good demand noted for conduit and fittings.

Sales at Good Volume for this Period in the Southeast

Splendid sales for this period of the year are reported in the Southeast, and a continued upward trend in the volume is anticipated through the fall months. Good crops throughout the section are adding to the general feeling of optimism, and the tobacco crop of 40,000,000 lb. in south middle Georgia is already reflected in improved purchases in that section. Unusual activities by the jobbing trade are resulting in quite a large volume of orders for electrical heating appliances, and the especial efforts of one large distributor to obtain orders of this equipment for future delivery are meeting with splended success. Central-station campaigns are also serving to hold up the volume of heating device orders, and a particularly successful percolator campaign has just been closed.

Very satisfactory business is reported in commercial and industrial wiring supplies, especially in Mississippi, Alabama and Florida, with good orders for this material from the Savannah district also in hand. The demand for conduit is good, one order for $8,000 worth of rigid iron conduit being the largest single purchase made. The demand for line materials continues unabated and a fair volume of high-tension transformers in voltages from 11,000 to 44,000 are being ordered. Purchases of heavy equipment by central-station companies continue to be in evidence, and two orders, one for $50,000 worth of 110,000-volt oil circuit breakers and another for $17,000 worth of 50,000-volt switches, were placed by one company.

Activities of the Trade

Westinghouse Insulator Patent Declared Invalid

Judgment has just been rendered by Judge Thomas D. Thacher in the United States District Court, Southern District of New York, in the suit brought by the Westinghouse Electric & Manufacturing Company, plaintiff, against the Jeffery-DeWitt Insulator Company, defendant. The suit was brought in equity for infringement of patent No. 1,373,578, granted to Percy R. Thomas, April 5, 1921, for improvement in electric insulators.

The court in its decision says: "There is little difference between the claims of this patent except in formal statement, none of which affects the issues in this suit, and the first claim may be taken as typical of all the others. . . . The alleged infringing device is similar to the plaintiff's insulator only in the employment of a plurality of prongs. In function and in method of attachment the defendant radically departs from the instruction of Thomas, and by virtue of this departure has produced a device of great commercial merit, whereas the proofs fail to disclose that the Thomas insulator has ever been in commercial use. The defense of invalidity must be sustained because the claims are excessive, and the complaint is accordingly dismissed without consideration of the additional defenses interposed by the defendant."

International Combustion Gets Large Orders

Orders have been received by the International Combustion Engineering Corporation, 43 Broad Street, New York, for boiler-room firing and steam generating equipment aggregating approximately $1,000,000. One of the orders, amounting to about $450,000 was received from the Federated Malay States for a complete power station to burn pulverized coal. The other orders were received from the New Orleans Public Service Corporation, which is adding "Lopulco" fuel systems, steel-wall furnaces and air heaters to its equipment, and the Phoenix Utility Com-

pany, which is installing air heaters and steel wall furnaces in the Deepwater plant of the Houston Light & Power Company. The two orders aggregate about $550,000.

General Electric Further Reduces Prices of "Mazda" Lamps

Gerard Swope, president of the General Electric Company, has announced a further reduction in the prices of "Mazda" lamps, effective Sept. 1, 1926, amounting to about 7 per cent on the sizes generally used of the new standard line of lamps and approximately 5 per cent on all types. This is the eighth reduction in "Mazda" lamp prices since 1920. The latest reduction means a saving to the public of approximately $4,000,000 a year.

The prices of "Mazda" lamps are now 44 per cent below the 1914 prices, which compares with a 65 per cent increase in the average cost of commodities since that year. The reductions in "Mazda" lamp prices have been made possible primarily by better manufacturing methods and by standardization and simplification of lamp types.

Couzens Ice Machine Dissolves Rather than Sell on Credit

With the industry daily expecting the announcement of a new Detroit factory and other additions to plant facilities of the Couzens Ice Machine Company comes the announcement that the company, incorporated last December with $1,000,000 capital, would abandon the enterprise, according to an item that appeared in the New York *Times* on Thursday. Superior Refrigeration, Inc., of Lima, Ohio, was taken over some months ago by the Couzens company and has since been operating as the "Superior Division."

Senator Couzens, who is president and chief stockholder of the company, gave as the reason for the dissolution that, in his opinion, the manufacture and distribution of electrical refrigerators seemed bound up with the installment or deferred-payment method of selling. This the Senator believed to be economically unsound. Refusing to "emulate the methods of his competitors" and failing to "see a future for an industry whose products must be distributed on a credit basis," Senator Couzens voted to dissolve the corporation.

General Electric Reorganizes Manufacture of Transformers

The manufacture of power transformers in sizes from 501 kva. to 3,500 kva. inclusive, up to and including 73,000-volt equipment, has been transferred from the Fort Wayne to the Erie works of the General Electric Company. The design of these transformers will be under the immediate direction of C. N. Brubaker, who has been appointed engineer of the transformer department at the Erie works. He will have charge of all engineering work on transformers carried on at Erie, under the direction of the general transformer engineering department at Pittsfield.

The engineering and manufacturing of distribution transformers, up to and including 500 kw., at Pittsfield has been organized as a department under the direction of E. A. Wagner, who has been appointed managing engineer of the distribution transformer department of the Pittsfield works. He will also have general supervision of the engineering on distribution transformers manufactured at the Fort Wayne and Oakland works. E. D. Treanor has been appointed designing engineer of the distribution transformer department at the Pittsfield works, and R. H. Chadwick has been appointed engineer of the transformer department of the Fort Wayne works.

Commercial Truck Acquires Electruck Corporation

The Commercial Truck Company, with plant and general offices at 300 Hunting Park Avenue, Philadelphia, has purchased the assets, including machinery, equipment, trucks completed or partly completed, parts, drawings, patterns, dies, etc., and all patents of the Electruck Corporation, manufacturer of electric street trucks, known under the trade name of "Electruck." The Commercial Truck Company announces that it is now in a position to furnish parts and supply such other services as may be required on the products of the Electruck Corporation.

Drying Systems, Inc., Acquires National Rotary Air Filter

Drying Systems, Inc., 1800 Foster Avenue, Chicago, manufacturer of the "Phoenix" constant-effect air filter, on July 1, 1926, acquired the full and exclusive rights to the "National" rotary air filter, previously manufactured and sold by the National Air Filter Company of Chicago. From that date the "Phoenix" constant-effect air filter and the "National" rotary air filter have been engineered and sold by the air filtration department of Drying Systems, Inc., and the National Air Filter Company has become the sole American manufacturer of both filters.

The company states that the acquisition of the "National" rotary air filter provides it with two distinct types of perfected air filtration equipment, thus enabling it to meet effectively any air filtration requirement, either industrial or for a public building, under any conditions. The company has also organized a staff of experienced air filtration engineers recruited both from the former Phoenix filter department and from the National Air Filter Company.

Edge Moor Iron Gets Repeat Order for Single Pass Boilers

Two additional Edge Moor single-pass boilers have been ordered by the Binghamton Light, Heat & Power Company, Binghamton, N. Y., from the Edge Moor Iron Company, Edge Moor, Del. The first single-pass boiler sold was purchased by that company, and it went into service late in 1924. The new boilers are to be built for 450-lb. working pressure, and each will have a normal capacity of 120,000 lb. of steam per hour, with a maximum capacity for continuous operation of 150,000 lb. per hour.

The Valley Electric Company, 4515 Shaw Avenue, St. Louis, has placed on the market the garage type G10 battery charger of the bulb type with a range of from one to ten 6-volt batteries and having a charging rate of 6 amp.

The Pittsburgh Transformer Company, Pittsburgh, announces that a small fire in its Manchester plant on Aug. 19 did very little damage and will not delay production perceptibly. The company states that no inconvenience to its custmers will result.

The Kuhlman Electric Company, Bay City, Mich., manufacturer of power, distribution and street-lighting transformers, announces the appointment of H. F. Darby, Jr., 1700 Walnut Street, Philadelphia, as direct factory representative in the Philadelphia district. For more than twenty years Mr. Darby was with the Cutter Electrical & Manufacturing Company and during the last six years was sales manager of that organization.

The American Circular Loom Company, 90 West Street, New York, manufacturer of rigid conduit, non-metallic flexible conduit, steel-armored cable and non-metallic sheathed cables, announces the appointment of Clyde L. Corbin as its representative in the states of Ohio, Kentucky, West Virginia and Pennsylvania west of Altoona. Mr. Corbin will make his headquarters at 206 Bessemer Building, Pittsburgh.

The Standard Turbine Corporation, Scio, N. Y., announces the appointment of C. R. Gould as its general manager. Mr. Gould has been identified with turbine manufacture for the past twenty years, and most recently with Kerr Turbine Company, with which firm he served in various capacities as purchasing agent, treasurer and secretary.

The General Electric Company has received an order for 7,000 additional ornamental "Novalux" street-lighting units for the city of Chicago. Three previous orders for a total of 15,500 units have already been installed. The units will be mounted on 12-ft. concrete octagonal poles manufactured by the Chicago Concrete Post Company.

The Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., manufacturer of safety switches, knife switches, etc., announces the election of a seventh director, Nathan D. Prince, president of the Hartford-Connecticut Trust Company of Hartford. The reorganization of the company was announced in the Aug. 14 issue of the ELECTRICAL WORLD.

The Harnischfeger Corporation, Thirty-eighth and National Avenues, Milwaukee, manufacturer of overhead electric cranes and gasoline engine-driven excavators, announces that L. N. Ridenour, formally with the Wellman, Seaver, Morgan Company and later agent for contractor's equipment in Cleveland, has been appointed special factory representative. The corporation also announces that E. Lynn Puckett of Richmond, Va., has been

appointed district manager of the Charlotte (N. C.) office at 1118 Independence Trust Building.

The Warren-Whaley Electrical Company, Inc., Norfolk, Va., has been formed by James C. Warren and Edward A. Whaley to practice general engineering and to act as distributing representatives of electrical machinery.

The Circle F Manufacturing Company, Trenton, N. J., manufacturer of electrical and porcelain specialties, announces the appointment of the Mintel Electric Sales Company, 120 Hoefgen Avenue, San Antonio, Tex., as its representative in the states of Texas and Oklahoma.

The Beaver Machine & Tool Company, Inc., 625 North Third Street, Newark, N. J., manufacturer of electrical specialties, has placed on the market an attachment plug with the cap portion of the standard separable plug made in the form of an elongated handle.

The Century Electric Company, St. Louis, is remodeling its building at Nineteenth and Olive Streets to conform to the proposed widening of Olive Street.

The Elliott Company, Pittsburgh, following the recent purchase of the Ridgway Dynamo & Engine Company of Ridgway, Pa., as announced in the ELECTRICAL WORLD of July 31, 1926, has negotiations under way for the purchase of a plot of land in the vicinity of the plant for the erection of a new addition to provide for considerable advance in its present capacity. The purchasing company is also said to be arranging for the immediate closing of its branch plant at Wellsville, N. Y., with intention of transferring operations to the Ridgway unit.

A. E. Bacon, formerly associated with the Mine & Smelter Supply Company, Denver, has completed negotiations with several manufacturers to act as their district representative with headquarters in that city. Among the companies represented are the Benjamin Electric Manufacturing Company, the American Pipe Bending Machine Company, the Autovent Fan & Blower Company, the McGill Manufacturing Company, the Autocall Company and the National Metal Molding Company.

The Arrow Electric Company, Hartford, Conn., manufacturer of wiring devices, has purchased additional land adjoining its factory on Capital Avenue, to be used for future expansion.

B. J. Carney & Company, Grinnell, Iowa, producer of cedar poles and posts and wood preservers, announces that Henry M. Hughes, 239 Oliver Building, Pittsburgh, has been appointed a representative of the company in that territory. The company also announces the appointment of J. A. McAuliffe, 214 Old South Building, Boston, as its New England representative.

The Electric Storage Battery Company, Nineteenth and Allegheny Streets, Philadelphia, has filed plans for the construction of its proposed new plant at Hunting Park Avenue and Donath Street, to be 170 ft. x 190 ft. The company will also build a new branch works on Roselawn Avenue, Detroit.

New Trade Literature

ELECTRICAL RESISTANCE ALLOYS.—"Alloys for Electrical Resistance" is the title of data book R-26 issued by the Driver-Harris Company, Harrison, N. J. The book was compiled as an aid to those whose responsibility it is to properly select the alloys they use in manufacturing processes, and it contains up-to-date data in connection with "Nichrome" and the other various Driver-Harris alloys used for heating elements in electric heaters of all kinds.

POWER-TRANSMITTING EQUIPMENT.—A catalog of power-transmission equipment has been issued by the Hill Clutch Machine & Foundry Company, Cleveland, in three sections. Section 26A covers shafting and bearings and includes an illustrated description of a new flexible coupling. Section 26B covers clutches pulleys and belt tighteners. A complete horsepower table is presented from which friction clutch or plain pulleys may be chosen to meet any requirements. Section 26C covers rope drives, agitators, gears, speed transformers and sprockets. The sections in general contain much power transmission and engineering information.

RHEOSTATS.—Catalog No. 1140 issued by James G. Biddle, 1211 Arch Street, Philadelphia, describes and illustrates the "Jagabi" rheostats. Attention is also called to the Model A laboratory potentiometer, the S-H standardizing set (industrial potentiometer), dial-pattern calibrated resistance boxes and Frahm vibrating-reed frequency meters.

INSULATORS, TROLLEY-LINE MATERIALS, ETC.—Catalog No. 20 has been issued by the Ohio Brass Company, Mansfield, Ohio, and describes its line of high-tension insulators, trolley-line materials, rail bonds and tools, third-rail insulators, car equipment specialties and brass valves. This 945-page catalog thoroughly illustrates and describes the company's products and includes a number of useful tables on trolley wire, copper wire, aluminum wire, standard and extra heavy pipe, etc.

WATT-HOUR METERS.—"Registers of Revenue" is the title of publication No. C-1753 issued by the Westinghouse Electric & Manufacturing Company, and which describes the advantages of the design of its type OB watt-hour meter. In this bulletin the upper halves of the pages of the descriptive matter are devoted to the essentials characteristic of watt-hour meters from the standpoint of the central-station man, and the lower halves are devoted to the various outstanding factors regarding the company's type OB watt-hour meter.

FURNACE PULVERIZER EQUIPMENT.—A bulletin describing the "Simplex Unit System" pulverized-coal equipment has been issued by the Furnace Engineering Company, Inc., 5 Beekman Street, New York. The bulletin contains a complete description of the equipment and also illustrates and describes a number of actual installations.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Lourenco Marques, Portuguese East Africa (No. 21,821), of lighting arresters for alternating current power plant.

An agency is desired in Geneva, Switzerland (No. 21,822), for electric safety razors.

An agency is desired in Paris, France (No. 21,833), for electric refrigerators.

An agency is desired in Paris, France (No. 21,833), for electric household appliances.

An agency is desired in Paris, France (No. 21,834), for electric household appliances.

Purchase is desired in Ronneburg, Germany (No. 21,842), of electric butt-welding machinery.

Purchase is desired in Melbourne, Australia (No. 21,854), of radio sets and parts.

An agency is desired in Leipzig, Germany (No. 21,855), for small motors and generators.

An agency is desired in Halifax, Nova Scotia (No. 21,856), for electric household appliances, electric lamps, and electric fixtures.

An agency is desired in Halifax, Nova Scotia (No. 21,856), for batteries.

An agency is desired in Sydney, Australia (No. 21,862), for automatic street signals, and resistance wires.

Purchase and agency are desired in Stuttgart, Germany (No. 21,863), for electric automobile devices.

Purchase and agency are desired in Johannesburg, South Africa (No. 21,886), for combination radio and phonograph.

Purchase and agency are desired in Antofogasta, Chile (No. 21,905), for electric motors and drills.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

GREENWICH, CONN.—The New York, New Haven & Hartford Railroad Company, New Haven, Conn., has been granted permission for the construction of a power dam on the Mianus River, near Greenwich, to be used in connection with its power plant at Cos Cob.

AUGUSTA, ME. — The Cushnoc Paper Company contemplates the installation of electric power equipment in connection with proposed expansion at its mill. A fund of $500,000 is being created for the work.

BOSTON, MASS.—A power house will be constructed by the Board of Trustees, Beth Israel Hospital, at its proposed institutional buildings at Brookline and Longwood Avenues.

Middle Atlantic States

ROCKLAND, DEL.—The Wilmington & Philadelphia Traction Company has work in progress on a transmission line. Light and power heretofore has been furnished from the Jessup & Moore Company's paper-mill power plant.

WASHINGTON, D. C.—Bids will be received by the Board of District Commissioners, District Building, until Sept. 2, for fixtures for lamp posts. Also, until Sept. 10, for a quantity of cast-iron lamp posts and fittings.

BAYONNE, N. J.—The Public Service Electric Company plans to erect a power house at 209-211 Orient Street, to cost $43,000.

LONGPORT, N. J.—The Atlantic City Electric Company, Atlantic City, N. J., has concluded negotiations for the purchase of the municipal electric lighting plant and plans extensions in transmission lines.

NEWARK, N. J. — The Weyerhaeuser Sales Company, 285 Madison Avenue, New York, N. Y., will install electric power equipment at its proposed lumber plant at Port Newark, estimated to cost about $450,000.

BROOKLYN, N. Y.—The Segal Lock & Hardware Company, 155 Leonard Street, New York, N. Y., plans the installation of electric power equipment at its proposed new local plant at Ferris, Sullivan and Walcott Streets, estimated to cost about $500,000.

BUFFALO, N. Y.—The Rochester Gas & Electric Corporation, Rochester, N. Y., has secured permission to issue preferred stock in amount of $3,680,000, the proceeds to be used in part for extensions and improvements.

NEW YORK, N. Y.—The New York Edison Company has secured a permit for the construction of a three-story power distributing station, 75 ft. x 90 ft., at 441-5 West Forty-third Street, estimated to cost in excess of $500,000.

PORT RICHMOND, N. Y.—The American Linseed Company, 297 Fourth Avenue, New York, N. Y., will install electric power equipment in its proposed local two-story plant, reported to cost about $300,000.

STATEN ISLAND, N. Y.—A white way will be installed on Post Avenue through its length from Richmond Avenue to Clove Road. Additional lights will also be installed on West New Brighton streets.

SYRACUSE, N. Y.—The Continental Can Company, East Water Street, will install

electric power equipment in its proposed two-story and basement addition, estimated to cost $160,000.

WESTERLO, N. Y.—The Central Hudson Electric Company plans to extend the electric service from the present terminus in Greenville to South Westerlo. The present transmission line to Greenville will be changed over to operate at 4,000 volts.

CAMBRIDGE SPRINGS, PA.—The City Council has plans under way for the erection of an ornamental street-lighting system on the main business thoroughfares of the city.

CHATSWORTH, PA.—The State Department of Institutions and Agencies, Harrisburg, Pa., is planning the installation of additional conduit lines for lighting service at the State Colony for Feeble-Minded Males at Four-Mile, near Chatsworth.

DONORA, PA.—Plans are under consideration for the extension of the lighting system across the Donora-Webster bridge into the last-na ned town in Westmoreland County.

GOWEN, PA.—The Buck Mountain Coal Mining Company plans the installation of equipment for the complete electrification of its plant, to cost approximately $400,000.

LISBURN, PA.—The United Electric Company, Carlisle, Pa., has made application for permission to acquire the York County Electric Company, Fairview Township, York County, and the light and power franchise of William I. Hoffman, Lisburn, and vicinity. The company plans the construction of transmission lines into the territory for general commercial service.

PHILADELPHIA, PA.—The United Gas Improvement Company has filed plans for the construction of a substation at Castor and Creston Streets to cost close to $14,000.

SCRANTON, PA.—The F. Wesel Manufacturing Company, 73 Cranberry Street, Brooklyn, N. Y., plans the installation of electric power equipment in its proposed local branch plant, reported to cost about $150,000.

EAST RADFORD, VA.—The Great Valley Coal Company, E. C. Searles, McCoy, Va., president, plans the installation of electric power equipment in connection with proposed extensions and improvements at its properties, estimated to cost close to $1,000,000.

North Central States

CHICAGO, ILL.—The Olson Rug Company, 32 South Laflin Street, will install electric power equipment in its proposed new mills at Crawford and Diversey Avenues, estimated to cost approximately $900,000.

CHICAGO, ILL.—The Acme Steel Company plans the installation of electric power equipment in connection with expansion in its plant at Riverdale, estimated to cost in excess of $1,000,000.

PITTSFIELD, ILL.—The Central Illinois Public Service Company plans to construct a transmission line between Pittsfield, Nebo and Pleasant Hill, Ill., and to install a distribution system in each city; also an electric system in Woodson, Ill.

BRISTOL, IND.—A new lighting system will be installed on Main Street.

MUNCIE, IND.—The Ball Brothers Hospital Association, care of Ball Brothers, Inc., is having plans prepared for a power plant in connection with a new institutional building and nurses' school, estimated to cost $1,000,000. Kibele & Gerrard, 118 East Adams Street, are architects.

DES MOINES, IOWA.—The City Council is considering plans for the installation of an ornamental lighting system on Fourth and Grand Avenues, to Keosauqua Way. K. C. Kastberg is engineer.

ABILENE, KAN.—The main lines of the United Power & Light Corporation running west from Manhattan are to be connected with the new Tecumseh generating station of the Kansas Power & Light Company by an additional transmission line to be built up the Kaw River Valley.

BATTLE CREEK, MICH.—The Kellogg Company contemplates the installation of electric power equipment in connection with proposed expansion at its local cereal plant, estimated to cost about $130,000.

DETROIT, MICH.—The L. A. Young Industries, Inc., 9200 Russell Street, has filed plans for the construction of a one-story power plant at its automobile equipment factory, estimated to cost about $125,000. C. W. Brandt, Kresge Building, is architect.

MARSHALL, MICH.—The City Council has tentative plans under advisement for enlargments in the municipal electric power plant, including the installation of a Diesel engine and other equipment.

MILFORD, MICH.—The General Motors Corporation, General Motors Building, Detroit, Mich., will soon begin the construction of a steam power house, coal storage and service building, estimated to cost $115,000.

PONTIAC, MICH.—Plans for rebuilding the plant of the Fisher Body Company, a portion of which was recently destroyed by fire, with a loss of over $100,000, include a one-story power plant and the installation of considerable electrical machinery and equipment.

THOMPSONVILLE, MICH.—The Michigan United Light & Power Company, Ludington, Mich., has negotiations under way for the purchase of the municipal electric light and power plant, and plans extensions in transmission lines.

BELLE PLAINE, MINN.—The Interstate Electric Company contemplates the construction of a transmission line from this place to Le Sueur, by way of St. James.

BRAMPTON, N. D. — The Otter Tail Power Company, Fergus Falls, Minn., plans the construction of a transmission line from Newark, S. D., to this place. The company has also secured permission for the construction of a transmission line from St. Petersburg to Concrete, N. D.

EDMORE, N. D.—The City Council has negotiations under way with the Electric Service Company, Lokota, N. D., for the construction of a transmission line from the last-noted place to Edmore.

MADDOCK, N. D.—The City Council contemplates the installation of a municipal electric light and power plant, reported to cost close to $25,000.

PAINESVILLE, OHIO.—P. C. Tomson & Company, 27 Washington Avenue, Philadelphia, Pa., will install electric power equipment at its proposed local lime plant, reported to cost about $150,000.

HUDSON, WIS. — The Willow River Power Company will soon begin the construction of a steam-operated electric power plant for which plans were recently approved by the State Commissioners.

KENOSHA, WIS.—The installation of lights at 23 different street intersections has been ordered by the City Council.

MADISON, WIS.—Several new transmission and farm lines will be built by the Wisconsin Power & Light Company. A 7½-mile, 6,600-volt rural extension will be built out of Peebles to serve 85 customers; the present overloaded 6,600-volt Green Lake-Ripon line will be rebuilt to carry 11,400 volts; the 6,600-volt line between Fairwater and Brandon will be relocated and increased to 11,400 volts. A new distribution system is being mapped out for Brandon. The transmission line between Paoli, Basco and Belleville will be changed from 2,300-volt construction to 11,400 volts. A new hydro-electric plant and auxiliary equipment will be installed at Blanchardville this fall. A 33,000-volt line will be constructed from Blanchardville to Hollandale, where a distribution system will be installed at the latter place, which is now without electric service. A 33,000-volt line is to be built from Mauston to the Davis Mills, where a contract has been closed with the owners to buy surplus current. In order to relieve the heavily loaded 6,600-volt line out of Columbus, serving the towns of Fall River, Otsego, Doylestown, and Rio, this line will be extended from Rio to Wyocena, thence to the 33,000-volt substation at Pardeeville, creating a power loop.

MANITOWOC, WIS.—Proposal for the installation of an ornamental street lighting system in Shorewood Manor in the northeast section of the city has been adopted by the Council.

WISSOTA, WIS.—The Northern States Power Company has plans under way for extensions and improvements in its local steam-operated electric power plant, including the installation of additional equipment.

Southern States

TARRANT, ALA. — The Vulcan Rivet Company plans the installation of electric power equipment in connection with proposed extensions in its plant, estimated to cost about $200,000.

BLYTHEVILLE, ARK.—The Arkansas-Missouri power company is arranging a note issue of $600,000, a portion of the proceeds to be used for extensions and improvements.

BUNNELL, FLA.—The Florida Power & Light Company, Miami, has concluded negotiations for the purchase of the local municipal power plant, and plans extensions in transmission lines.

CORTEZ, FLA.—The City Council will install an improved street-lighting system in the downtown section and adjoining streets. A portion of a bond issue of $100,000, recently approved for municipal improvements, will be used.

DAYTONA BEACH, FLA.—The Board of City Commissioners is arranging an appropriation of $150,000 for the installation of a municipal fire alarm system. Walter A. Richards is city manager.

MIAMI SHORES, FLA.—The City Council plans the installation of an improved street lighting system. A portion of a bond issue for $175,000, soon to be voted, will be used.

OCALA, FLA.—Bonds to the amount of $350,000 have been sold. The funds will be used for the extensions of the city electric light system, construction of a plant, street and park improvement, etc.

TALLAHASSEE, FLA.—Permission has been granted the Florida Power & Light Company to run a high power electric line from Pierce to Okeechobee.

TAMPA, FLA.—The Tampa Electric Company plans the construction of a huge plant on the Alafia River. Also the enlargement of present plants and extensions of lines.

BILOXI, MISS.—The Mississippi Power Company, B. E. Eaton, president, plans to construct a power line connecting all Mississippi coast cities, erect a number of substations, rebuild local distribution system and improvements and additions to Gulfport steam plant.

YAZOO CITY, MISS.—The City Council is considering extensions and improvements in the municipal electric power plant, with the installation of additional equipment, estimated to cost about $85,000.

GUYMON, OKLA.—Plans are under way for the installation of a new street-lighting system on Main Street.

MARIETTA, OKLA.—The Oklahoma Gas & Electric Company will construct a transmission line out of Ardmore to connect Marietta.

PICHER, OKLA.—The Empire District Electric Company, Joplin, Mo., is said to be planning extensions in transmission lines in this section. A light and power franchise has recently been secured.

Pacific and Mountain States

BERKELEY, CAL.—The City Council is having specifications completed for a proposed ornamental lighting system on Solano Avenue, from the Alameda to Neilson Street.

GERBER, CAL.—A new lighting district is being formed, to be known as the Gerber Lighting District, which plans the early installation of an improved lighting system in the area beyond the town limits.

LONG BEACH, CAL.—The Ford Motor Company, Detroit, Mich., is reported to be planning the construction of a power plant at its proposed local assembling works, for which site was recently acquired. The entire project will cost in excess of $500,000.

LOS ANGELES, CAL.—The City Council has adopted an ordinance authorizing the installation of ornamental lamps on portions of Seventy-third, Seventy-fourth, Seventy-fifth and a number of other streets.

PITTSBURG, CAL.—The Pioneer Rubber Mills, Inc., plan the installation of electric power equipment in connection with a proposed new one-story plant, reported to cost $100,000. Benjamin G. McDougall, 353 Sacramento Street, San Francisco, is architect.

SAN FRANCISCO, CAL.—The Market Street Railway Company has plans for a one-story power substation at Ordway Street and Bruno Avenue, estimated to cost about $14,000.

SAN FRANCISCO, CAL.—The Yosemite Power Company, San Francisco, Cal., has applied for permission to appropriate water from the south and middle forks of the Tuolumne River, Tuolumne County, for a hydro-electric power project involving three individual power plants and two power dams. Transmission lines will be built. The entire project will cost about $5,500,000.

HAVRE, MONT.—The City Council has approved an ordinance for the installation of a municipal fire alarm system. Bids will be asked in the near future. B. F. Payne is city clerk.

PORTLAND, ORE.—The Oregon-Washington Sugar Refining Co., Board of Trade Building, Portland, Ore., plans the installation of electric power equipment in

its proposed beet sugar refinery, reported to cost close to $1,200,000.

VALE, ORE.—J. Edwin Johnson, and associates have applied for permission to appropriate waters from the Malheur River, a tributary of the Snake River, Harney County, for a proposed hydro-electric power development, estimated to cost $400,000, with transmission lines.

WENDLING, ORE. — The Mountain States Power Company, Albany, Ore., will soon begin the construction of a transmission line from Springfield to this place, about 20 miles, estimated to cost $30,000.

Canada

GRAND FALLS, N. B.—The St. John Power Company, a subsidiary of the International Paper Company, New York, N. Y., will soon begin the construction of a power dam and hydro-electric power plant on the St. John River, with initial capacity of 60,000 hp. A transmission line will be built. The entire project will cost in excess of $5,000,000.

BROMPTONVILLE, QUE.—The Brompton-ville Pulp & Paper Company, Ltd., will install electric power equipment at its proposed local newsprint mill, to cost approximately $1,500,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued Aug. 10, 1926)

1,595,108. ELECTROPLATING APPARATUS; F. W. McCormick, Grand Rapids, Mich. App. filed Oct. 20, 1925. Having a barrel which includes metal ends connected by metal cross members which serve as contacts and against which the articles within the barrel to be plated come into contact, the frame thus being equipped with detachable barrel segments, each of which includes an open metal frame with an inner covering of suitable material which is a non-conductor of electricity. All of the metal parts which are submerged at any time except the contact strips in the electrolyte are covered at their outer surfaces at least with a rubber-like composition which is of insulating material and which will not conduct electricity.

1,595,143. WELDING ROD AND PROCESS OF WELDING; G. E. Doan, Cleveland, Ohio. App. filed Oct. 10, 1921. A process of and means for making highly ductile welds between steel rail ends and plates.

1,595,272. HAIR-WAVING APPARATUS; E. W. Weathers, San Diego, Cal. App. filed Nov. 6, 1924.

1,595,293. TRACTION INSTALLATION WITH DIRECT-CURRENT MOTOR; J. P. Martin, Paris, France. App. filed Dec. 12, 1923. A combination of overload and underload relays, controlled by the current flowing through the motors, with a multiple controller.

1,595,348. PLUG FOR ELECTRIC CIRCUIT CONNECTIONS; M. W. McArdle, Chicago, Ill. App. filed April 16, 1925. Detachable plug as used with appliances.

1,595,373. ELECTRIC SWITCH; H. F. Bates, Ironwood, Mich. App. filed Dec. 6, 1920. For use in mines or in other localities where it is essential to have the working parts of the switch protected from gas and from dampness.

1,595,520. DOOR OR WINDOW-OPERATED SWITCH; P. J. Larson, Minot, N. D. App. filed April 18, 1922. Which may be employed with either swinging or sliding closures.

1,595,522. ELECTRIC LAMP WITH SEVERAL FILAMENTS; A. Mullor, Beziers, France. App. filed July 8, 1924.

1,595,535. HEADLIGHT BULB; W. H. Wood, South Euclid, Ohio. App. filed Sept. 2, 1925. With series resistance for dimming built in the lamp.

1,595,550. VARIABLE-SPEED INDUCTION MOTOR; D. G. Howard, Annapolis, Md. App. filed Feb. 10, 1923.

1,595,598. AUTOMATIC-ALARM MECHANISM; J. S. Brennan, Attleboro, Mass. App. filed May 29, 1925. Adapted for use in connection with an electric bell to indicate fires or the overheating of furnaces, chimneys or other parts of heating equipment.

1,595,646. RECEPTACLE OR CONTAINER; J. J. Compo, Defiance, Ohio. App. filed July 29, 1924. For storage batteries and the like.

1,595,653. TREE INSULATOR; T. E. Gammon and H. D. Averill, Haverhill, Mass. App. filed Nov. 19, 1924.

1,595,691. TERMINAL BLOCK FOR MAGNETIC CHUCKS AND THE LIKE; F. L. Simmons, Woonsocket, R. I. App. filed March 14, 1918.

1,595,692. COMPACT MAGNETIC CHUCK; F. L. Simmons, Woonsocket, R. I. App. filed June 30, 1920.

1,595,735. FLUORESCENT TUBE; M. Schmierer, Berlin, Germany. App. filed Feb. 27, 1914.

1,595,736. REGULATOR SYSTEM; H. K. Sels, Pittsburgh, Pa. App. filed March 15, 1923. To control the power-factor of a circuit between two sources of supply that are connected together.

1,595,737. EXCITATION OF SYNCHRONOUS COMMUTATING POLES; E. B. Shand, Pittsburgh, Pa. App. filed April 11, 1922. To provide a negative, or reversed, excitation on the commutating pole at the critical period of unneutralized motor reaction; to provide a commutating pole having compensating ampere turns which are varied in accordance with the direction and rate of change of the load.

1,595,742. FUSE MECHANISM; H. B. Taylor, Forest Hills Borough, Pa. App. filed Sept. 12, 1922. An expulsion fuse tube having at least one end open, and a fuse element within the tube comprising a plurality of sections of conductive material fusible only at relatively high temperatures joined by a conductive material fusible at relatively low temperatures.

1,595,749. THERMAL RELAY; N. K. Andersen, Wilkinsburg, Pa. App. filed May 11, 1921. Embodying thermal responsive means that are operated with a relatively quick movement at a predetermined temperature.

1,595,750. REGULATOR SYSTEM; J. H. Ashbaugh, Wilkinsburg, Pa. App. filed June 24, 1924. That shall be quickly responsive to correct the variations in a predetermined characteristic of a power circuit. An alternating-current system embodying a synchronous condenser that is excited by means of an auxiliary or exciter generator. A vibrating contact regulator is provided for adjusting the voltage of the exciter generator in accordance with the line voltage.

1,595,757. TRIP-FREE MECHANISM FOR TANK CIRCUIT BREAKERS; W. O. Coates, Charlton-Cum-Hardy, England. App. filed Sept. 19, 1922.

1,595,768. ARC-SUPPRESSING DEVICE; O. H. Eschholz, Wilkinsburg, Pa. App. filed Nov. 29, 1920. A circuit-interrupting system that shall comprise an electric valve of such characteristics and so related to the interrupter as to shunt the circuit current around the interrupter when the latter is opened and to automatically build up resistance to the current until the flow of the latter is stopped.

1,595,775. 1,595,776. ARC LAMP; C. A. Green, Chicago, Ill. App. filed Oct. 11, 1922. Arranged in groups for uniform lighting in connection with blue print machines, photo-engraving and other arts.

1,595,799. HEATED ELEMENT; H. R. Massingham, La Grange, Ill. App. filed Aug. 16, 1924. Electrically heated element employed in a mechanism for severing and removing insulation from a conductor.

1,595,801. MAGNETIC TOY; H. R. McDonald, Virginia, Minn. App. filed March 3, 1923. In which a floating figure, such as a fish is directed through the execution of a series of maneuvers in a body of water.

1,595,804. DISCONNECTING SWITCH; F. H. Miller, Wilkinsburg, Pa. App. filed Sept. 24, 1920. Knife blade switch that shall comprise spaced terminal members and a bridging structure therefor that shall be so movable to make and break a circuit therebetween as to conserve the head room or the space in which a pivoted switch arm of usual type swings. Using a folding blade.

1,595,819. WATER HEATER; L. L. Bluemlein, Hartsdale, N. Y. App. filed June 18, 1925. Instantaneous type.

1,595,838. PREFORMED ELECTRICAL COIL; H. W. Turner, Schenectady, N. Y. App. filed May 15, 1923. A coil which is solidified without the use of auxiliary bonding agents. The coil is made from a conductor covered with a fibrous insulating material which has been impregnated with a suitable non-hygroscopic adhesive insulating material, such as an asphaltum compound, and then suitable heat and pressure is applied to the coil whereby the asphaltum compound softens and cements the conductors of the coil together into a solid compact mass.

1,595,852. FUSE PLUG; N. C. Butler, Cleveland, Ohio. App. filed Oct. 8, 1920. Renewable.

1,595,853. SWITCH HANDLE; C. E. Canfield, Pittsfield, Mass. App. filed Nov. 21, 1921. For tap-changing switches for encased electrical apparatus such as transformers.

1,595,860. PUSH PLUG RECEPTACLE; R. E. De Lamar, New York, N. Y. App. filed June 12, 1922.

1,595,871. TROLLEY-SWITCHING MECHANISM; R. Rodriguez, Des Moines, Ia. App. filed Feb. 14, 1925. A switch in an overhead conductor adapted to be operated coincident with a track switch, whereby a trolley or current collector may be passed automatically from a main line to a siding or branch without independent manipulation thereof.

1,595,893. AUTOMATIC REGULATOR FOR ELECTRIC SYSTEMS; H. Terhorst, Donnybrook, N. D. App. filed April 12, 1924. A sensitive regulator which will respond quickly and accurately to slight variations in the generator circuit to maintain the battery charging rate substantially constant.

1,595,919. OUTLET FIXTURE LOCK; H. T. Paiste, Philadelphia, Pa. App. filed July 16, 1921. A mechanical device for coupling together a fixture and a receptacle so that current shall be free to flow through suitably engaged conducting elements.

1,595,936. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed Feb. 8, 1921. A fluid switch comprising two pressure chambers arranged to discharge in opposite directions, and a discharge chamber interconnecting said pressure chambers.

1,595,937. CONDENSER SYSTEM; H. M. Hobart, Schenectady, N. Y. App. filed Nov. 4, 1924. To improve the performance of inductive apparatus and in particular the operating performance of induction motors, any power factor improvement of the system to which the motor is connected being an incidental benefit.

1,595,956. ELECTRIC TEMPERATURE REGULATOR FOR INCUBATORS; G. A. Scheeffer, Indianapolis, Ind. App. filed June 9, 1921.

1,595,966. LIGHTING FIXTURE; L. A. Kempton, Schenectady, N. Y. App. filed March 26, 1921. Of the type wherein the wall or ceiling portion of the fixture comprises a wired unit and the bracket or hanging portion of the fixture comprises a second wired unit, the latter being adapted to be detachably connected mechanically and electrically to the former, electrical connection being made by means of a receptacle and plug connection.

1,595,967. ELECTRIC FURNACE; J. A. Seede, Schenectady, N. Y. App. filed Feb. 13, 1925. Induction type which may be operated on a polyphase electric supply source. Provided with a looped channel in which a portion of the molten charge forms a closed secondary, and in which circulation of the molten charge is produced by electromagnetic repulsion between the primary winding and the portion of the charge forming the secondary.

1,595,968. INDUCTION FURNACE; M. Unger, Pittsfield, Mass. App. filed April 18, 1922. In which the charge which comprises the secondary of the furnace is contained within a channel communicating with a reservoir which increases the capacity of the furnace and affords working space for making additions to and carrying out desired treatment of the charge.

1,595,969. FURNACE CRUCIBLE; M. Unger, Pittsfield, Mass. App. filed April 18, 1922. Adapted for induction furnaces.

1,595,970. INDUCTION FURNACE; J. M. Weed, Schenectady, N. Y. App. filed Dec. 29, 1921. In which the receptacle for the charge comprises an annular or looped portion of relatively small cross section within which the charge acts as secondary, and in communication therewith, a chamber or reservoir for increasing the furnace capacity for charge.

1,595,971. INDUCTION FURNACE; G. Faccioli, Pittsfield, Mass. App. filed June 5, 1922. In which the charge circulates by electromagnetic forces without endangering the continuity of operation of the furnace.

1,595,972. 1,595,973. LIGHTING FIXTURE; F. C. De Reamer, Bridgeport, Conn. App. filed Sept. 9, 1921. Of the type wherein the wall or ceiling portion of the fixture comprises a wired unit and the bracket or hanging portion of the fixture comprises a second wired unit, the latter being adapted to be detachably connected mechanically and electrically to the former, electrical connections being made by means of a receptacle and plug connection.